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Chemical Trade Recovery

THE Board of Trade returns for September disclose the welcome recovery for which we have been looking for the past few months in chemical overseas trade. The recovery is the more notable because, while the national figures have not improved, there is a good advance in the chemical trade figures. Chemical imports have increased £99,696, and chemical exports £75,696. Taking the larger test of trade over the first nine months of the year, chemical imports have increased £761,042, chemical exports have increased £75,885, and chemical re-exports have increased £4,084. It is true, unfortunately, that the imports have increased most, but the satisfactory point is that exports are still going up, though more slowly than one could wish.

There are some notable comparative figures, especially in the imports section. For example, acetic acid imports have increased from £47,068 to £80,533, coal tar products have dropped from £66,445 to £6,474, while crude glycerine imports have declined from £46,623 to £4,438. Again, while the imports of potassium compounds have advanced from £77,451 to £131,920, possibly due to their increased use in mixed or complete fertilisers, sodium nitrate imports have fallen from £79,245 to £8,565. The principal import increases, however, are in miscellaneous chemicals (£188,984 to £325,984) and in miscellaneous drugs and medicines (£101,625 to £156,676). Both dyestuff intermediates and alizarine imports are at a lower level.

On the export side, one notices at once that the already large figures of ammonium sulphate exports are further increased from £333,755 to £355,137, this being accounted for by increased consumption by Spain and the Canaries and unspecified "other countries." The decrease of about £50,000 in the export of coal tar products is explained almost entirely by a remarkable fall in benzol and toluol from £49,212 to £1,374. Corresponding with the heavy decline in crude glycerine imports, there is a welcome increase in the exports of distilled glycerine from £24,873 to £40,445 and of crude glycerine from £257 to £12,120. While potassium compound exports are lower by £3,625, those of sodium compounds, a distinctly British industry, are up from £224,544 to £314,022. Dyestuffs exports, again, show a satisfactory increase from £58,011 to £86,927. Exports of painters' colours and materials, usually one of the largest and most stable sections, are not quite so good as usual.

A Discussion on Rationalisation

THE paper that Mr. J. Davidson Pratt read before the Chemical Engineering Group last week on "Rationalisation" served as an excellent introduction to the understanding of a comparatively new subject. It was not exhaustive, for any one of the sections that Mr. Pratt dealt with, whether production or sales or finance or labour problems, would have been more than sufficient for a full evening's consideration. But it was certainly comprehensive, exploring the whole field, and concisely packed with information and suggestion on every important point. As an exposition, it admirably opened up a series of issues, and gave useful guidance without laying down dogmatic conclusions. At the end of the discussion, the meeting had obviously approached to a much clearer appreciation of what rationalisation really means.

The discussion was frankly critical. For this the chairman (Mr. Harold Talbot) was largely responsible, for, in his own happy way, he combined in his opening remarks appreciation and qualified dissent. This fashion was followed to the end, with the result that a number of interesting matters were treated from other points of view than that of the author. And yet the criticism was so good and so constructive that Mr. Pratt was able to agree with nearly all of it. It amounted not really to positive dissent, but aimed at the amplification or modification of this or that aspect. It was felt

at the close that the evening's study of the subject could hardly have been better ordered.

One of the first effects of the discussion was to emphasise the distinction between rationalisation and mere amalgamation. Size in itself may be a doubtful advantage, unless the larger resources that it provides are well employed. The elimination of competition, again, may be positively bad in its ultimate effects, both on the standard of efficiency and on the consuming class. On the other hand, the elimination of wasteful competition is obviously good, for it should cheapen production and benefit the consumer. Another point that attracted notice was the fear that increased productive capacity might outrun purchasing power, and that savings in production might be lost in expensive sales propaganda. As against this, however, it must be remembered that the cheapening of products automatically increases their use and enlarges the market, sometimes far beyond what was originally thought possible. It was interesting to hear an Australian engineer testify that he had found, in a stay of some months in this country, that the most efficient firms he had come across were not always the largest; that, in fact, in the latter class there was a considerable waste of time. This, of course, is no objection to rationalisation on a large scale; it is merely a warning against trusting to mere size.

There was reference, as one might expect, to the danger of large combinations exploiting the public in the control of prices. But this, in the long run, would prove a fatal policy for any combine. In the chemical industry it has been laid down emphatically that the strength of any great combine must ultimately rest on its better service and fair dealing with the consumer. And the industry has a good record in the matter. One may recall as one example that during the war, Brunner, Mond and Co. kept the price of soda crystals at about £5 a ton, refusing to take advantage of their monopoly during a time of national emergency, and that several prosecutions occurred in cases where soda crystals, sold at this fixed price by the makers, had been resold at vastly increased figures. Imperial Chemical Industries, Ltd., is pledged to this policy of giving the public the benefit of its improved services, and the strict faith it has kept with the public in its issue of shares and similar matters has produced a good impression. From the gas industry came authoritative evidence that amalgamations have definitely reduced production costs and charges to the consumer. From the same quarter, however, came a suggestion that, in the process of rationalisation or amalgamation, the claims of the technical and scientific staff might be swamped by the great bodies representing the employers and organised labour.

It was very clearly emphasised that rationalisation was not nationalisation, yet it was realised that in a case of national emergency it might be easy to switch over from one to the other, and that this possibility makes it all the more necessary that rationalisation schemes should always take account of the public welfare. In Germany, the European nursery of these large scale schemes, there is already a close alliance between industry and state and municipal authorities, though no one present could state exactly how far it goes. To the organisation of industry on rational lines—that is, on the most intelligent and efficient lines—provided the consumer and the worker are fairly treated, there can be no valid objection; the objections only apply to the misuse of a sound idea.

Changes in Patent Literature

An announcement has just been made of an impending change in the official publication of patent information. Readers of The Chemical Age who follow the development of the industry in the patent literature pages will be familiar with the two classes of patents, those applied for in the ordinary way, usually by persons resident in this country, and of which abstracts are given as soon as the specifications become available after acceptance, and those applied for under the International Convention, by which priority of date corresponding to an earlier application abroad can be obtained if application is made here within 12 months of the application abroad. In the latter case we have also given abstracts of the inventions as soon as they have been made public by the Patent Office, *i.e.*, 12 months after the date claimed, and in advance—sometimes as much as 18 months in advance—of acceptance of the specification.

In the near future, particulars of these foreign inventions will not appear in the official Patent Office journal until they have actually been accepted or have become void, and this advance information will therefore not be available to readers. The abstracts will appear as soon as the specifications are available. This does not, of course, affect the right of any interested party to inspect these foreign specifications at the Patent Office on payment of a search fee, at any time after the 12 months' limit referred to above.

The Calendar

21	Keighley Textile Society: "Wool Viewed as a Chemical in its Formation and Processing." A. T. King.	Kiosk Café, Keighley
21	Society of Chemical Industry (Yorkshire Section): The Phenomena Associated with Finely Divided Particles in Air." Professor R. W. Whytlaw-Gray. 7.15 p.m.	Great Northern Station Hotel, Leeds.
22	Society of Chemical Industry (Glasgow Section): "The Outlook in Chemical Industry in Great Britain, with special reference to the West of Scotland." 8 p.m.	St. Enoch Station Hotel, Glasgow.
23	Institute of Chemistry (London Section): "Recent Developments in the Scientific Study of Deep Sea Diving." Professor Leonard Hill.	30, Russell Square, London.
24	Institute of Fuel: Dinner and Dance 6.45 p.m.	Connaught Rooms, Great Queen Street, London.
24	Institution of the Rubber Industry (Manchester Section): Annual General Meeting. "Application of Electricity in the Rubber Industry." F. Walker.	Manchester Café, Ltd. Exchange Buildings, Manchester.
24, 25	Institute of Fuel: Two Days' Conference.	Institution of Mechanical Engineers, Storey's Gate, London.
25	Institution of Chemical Engineers. "The Fabrication of Acid-Resisting Steel Plant." Dr. W. H. Hatfield. 6.30 p.m.	Institution of Civil Engineers, Great George St., London.
25	British Association of Chemists (London Section): Smoking Concert. 7.30 p.m.	Broad Street Station Restaurant, London.

Chemical Engineers and Industrial Rationalisation

Discussion on Mr. Davidson Pratt's Paper

THERE was an interested company at Burlington House, London, on Friday evening, October 11—the first meeting of the new session of the Chemical Engineering Group—to hear Mr. J. Davidson Pratt's paper (a summary of which was published last week) on "Rationalisation—its meaning and application, with special reference to the chemical industry." The paper was followed by a frank and keen discussion. This was opened by the chairman (Mr. Harold Talbot) who said he did not agree with the author that rationalisation was relatively of recent growth. It was suggested that it had come into operation during 1923 to 1925, but the same process had really been going on for the past 10 or 15 years, although it received a great impetus during the war. The only difference between what was taking place now and what took place during the war was that costs did not matter during the war. To-day, however, with increasing competition, the position was very different in that respect; costs were even more important than men and materials, of course within limits.

Necessary Precautions

He did not, the chairman continued, like the inference (not a new idea) that this country was very much behind France and Germany in applying rationalisation processes to its main industries. A fair amount of effort in this direction was being put forth in the chemical industry as well as in the coal, steel and electrical industries. At the same time, where rationalisation was carried out on too large a scale—as perhaps was to be seen in the motor car industry—there was a danger of improvements in output taking place in jumps owing to the heavy cost of scrapping the machinery and bringing it up to date. It might be that the cost of scrapping in such circumstances might be more than the existing costs of production, so that care had to be exercised in applying the rationalisation process. One important aspect of rationalisation was that of labour. It appeared to him that it was of little use speaking of taking a long view of industry to a workman who had a wife and family to keep and who was likely to be put out of employment by the adoption of the methods suggested, and the attitude of labour, as represented by the trades unions, towards rationalisation would have to be watched before there could be any extensive application of rationalisation in this country.

Major F. A. Freeth (Imperial Chemical Industries) said he would like to see a warning given to industrialists in this country with regard to research. If we cast our minds back 21 years, how many processes had there been invented here? The Haber process was invented by a German professor, the Ostwald process by a foreign professor, and the Bergius process also came from the Continent. What was wanted here was what might be called a department for the sympathetic reception of lunatics, which would listen to inventors sympathetically.

Over-emphasis on Production

Mr. A. Parker said the paper showed the general tendency when discussing rationalisation to bear too heavily on the production side; distribution was a most acute problem at the present time. The whole touchstone of rationalisation was the elimination of avoidable waste, and anything done in the name of rationalisation that could not bear this test was not rationalisation. Whilst the co-ordinated programme lying behind this new economic theory was new, the various units of it such as standardisation, simplification, better control of output, and better use of labour, were all old things as units. Brought together as a co-ordinated programme, however, they were new. There was a common idea that standardisation and simplification were one and the same thing, but they were in fact very distinct. It was possible to standardise a product and yet be within miles of simplifying it, whilst on the other hand it was possible to simplify processes without standardising them. He challenged the statement that rationalisation will eliminate internal competition, although it might eliminate wasteful competition, which was quite a different thing, leaving healthy internal competition which was necessary to safeguard the consumers' interests in our present social organisation. A feature of rationalisation was the possibility that productive capacity would outrun purchasing power, as there was a tendency to do already, and that constituted a very grave danger. Again, there was also the risk, unless carefully watched, that savings in production costs would be more than swamped by sales propaganda. The full benefits of rationalisation would not be obtained until there was a complete change of outlook and attitude of the whole of the administrative side, and that had not yet taken place generally.

Dr. S. G. Barker (British Woollen Research Association) said that the first thing required in the woollen industry was not standardisation of material and product but standardisation of tests for material and product. In the textile industries there were no satisfactory standard tests. There were also required standardised methods of testing and, at any rate in the textile industry, greater knowledge of the fundamentals of the raw material with which they were working.

Irrational Chemical Societies

Dr. W. R. Ormandy said that if all the inhabitants of this world were idealists and altruists, the paper might lead to something. It was rather extraordinary that the Chemical Engineering Group of the Society of Chemical Industry should be asked to express an opinion upon rationalisation. One might almost expect that it was those who had themselves rationalised who were being asked to express an opinion, whereas in fact the chemical societies were the most irrational people that existed in the country. Was there anything more irrational than the way in which the technological and scientific societies were run? What was wanted was rationalisation within the chemical societies.

With regard to international rationalisation, he once spent a week in the house of one of the technical directors of a great coal and steel combine on the Continent, when the rationalisation of the coal and steel industry was being brought to a conclusion. When he asked why these industries in England had not been approached to come in, the reason was that whereas in Germany nine men could be found to sit round a table and speak for the whole coal and steel industries, if England were asked to come in there would be something like seven thousand directors to meet round the table. One of the greatest obstacles to rationalisation in this country was the attitude of so many who were in control of our industries.

Size Not Everything

Mr. J. Hendry (Adelaide, Australia) said he had been in this country for 6 or 8 months, and one thing that had struck him was that it did not necessarily follow that two firms combined could do better than the same two firms separately. The most efficient firms he had come across here were not the big firms. He had found some very efficient small firms. On the other hand, some of the large firms had been awful examples of inefficiency.

Mr. J. L. F. Vogel said he very much agreed with what Dr. Ormandy had said as to rationalisation of the scientific societies, and it certainly would be a great lesson to industrialists if an effort were made to rationalise the scientific side of the industry.

Mr. F. M. Potter said that rationalisation or amalgamation in the gas industry had definitely reduced production costs and also the charges to the consumer. There had also been in the gas industry, particularly during the past 10 years, a marked development of scientific control and an investigation of the complicated chemical processes which were now becoming a necessity in chemical industry. One tendency in rationalisation schemes was to look at them almost solely from the point of view of the management and labour sides, without the intermediate technical staff having anything to say in the matter. He believed that to be bad all round; there was a danger that this attitude would produce a type of time server, because of lack of contact between the directors and controllers of the industry and the scientific people engaged in it.

Mr. B. G. McLellan also complained that the technical men of the industry were not let into the secrets of the management side when attempts at rationalisation were being made, and expressed the view that if the chemists and engineers of the large firms contemplating amalgamation or rationalisation were taken into the confidence of the directors in the early stages of the negotiations, it would be better for everybody concerned.

Mr. Pratt's Reply

Mr. Pratt, replying to some of the points raised in the discussion, said he could only refer to the Balfour Committee report in support of what he had said that we in this country are behind other countries in the matter of rationalisation. He sympathised with Major Freeth and, generally speaking, was in agreement with almost all that had been said by the other speakers. One of the snags of rationalisation was that if it did eliminate internal competition it was likely to be suspect, and with a Labour Government in power they might find rationalisation or amalgamation turned into nationalisation. He also sympathised with what Dr. Barker had said with regard to tests, but that was a very difficult matter. As to a question asked regarding State and municipal control in Germany, he knew that in Germany there was a close linking up of industries with the State, but exactly how far it went he was unable to say. He quite agreed, further, that there was certainly a danger that rationalisation would make it easy for nationalisation, and if there was not fair play for the public we might find a Labour Government turning rationalised industries into nationalised industries. Whilst fully agreeing with Dr. Ormandy, he had definitely not dealt with the subject he had raised because he felt it would be flogging a dead horse. It was necessary to put our own house in order before we could expect to make much progress otherwise. Finally, Mr. Pratt said it was very difficult to know what to do to remedy the difficulty mentioned by Mr. Potter and Mr. McLellan as to the technical men in firms not being consulted concerning rationalisation schemes. Perhaps some remedy would arise if the technical men were not so divided among themselves. They were so divided that it was difficult for them to speak with one voice.

The meeting closed with a cordial vote of thanks to Mr. Pratt.

Monosodium Glutamate as a Chemical Condiment

By John E. S. Han

Glutamic acid, in the form of its monosodium salt, is freely used as a condiment in the Far East by housewives, restaurant-keepers, Buddhists, vegetarians, etc. The following account of the subject has recently appeared in "Industrial and Engineering Chemistry."

ALL proteins yield amino acids upon hydrolysis. About eighteen amino acids have been obtained from proteins. They are probably condensation products of amino acids, the condensation being assumed to be between the carboxyl group of one and the amino group of another. When any particular protein is hydrolysed, whether by acid, alkali, or steam, the same amino acids are produced and in the same proportion. During the process of digestion, the digestive enzymes convert the food protein very largely into the same substances as those produced by boiling acids. The final products of hydrolysis are consequently the units with which the process of assimilation chiefly deals(3).

d-Glutamic acid, $C_5H_9NO_4$, one of the common amino acids, was discovered by Ritthausen (7) in 1866 among the products of hydrolysis of wheat gluten by sulphuric acid. It occurs in both animal and vegetable proteins, and is one of the principal constituents of meat and vegetable extracts. Gliadin and glutenin, the two chief proteins that occur in approximately equal proportions in wheat gluten, were found to yield, upon hydrolysis, 37·33 and 23·42 per cent. of glutamic acid respectively (1). Glutamic acid is harmless. When administered as food, 96 per cent. is absorbed, part being used up in protein synthesis and the rest being oxidised to urea (3).

Properties of Monosodium Glutamate

Glutamic acid is dibasic and forms both acid and normal salts. Ikeda, during the course of researches on the seaweed *Laminaria japonica* (used for its flavour and having the taste of monosodium glutamate), discovered that the univalent ion ($C_5H_8NO_4$) of glutamic acid possesses a decided meatlike taste. The intensity of the taste can be judged from the fact that 1 part of monosodium glutamate, $NaC_5H_8NO_4$, dissolved in 3,000 parts of water is just perceptible to the taste. As the corresponding threshold values of cane sugar and table salt are 1:200 and 1:400 respectively, the flavouring power of monosodium glutamate is fifteen times stronger than cane sugar or seven times stronger than table salt.

The intensity of the meatlike taste in a solution of monosodium glutamate increases with the concentration of ($C_5H_8NO_4$) ions, but not in exact proportion. Thus, when the concentration of ($C_5H_8NO_4$) ions is doubled, the taste is intensified, but not quite doubled. On the contrary, the salty taste is more than doubled when we exactly double the concentration of sodium chloride in a solution. Evidently, the taste of ($C_5H_8NO_4$) ions would not be appreciable if large quantities of both glutamate and sodium chloride existed in the same solution. If such a solution is greatly diluted, the salty taste disappears and that of glutamate becomes predominant. The highest flavouring efficiency is obtained when glutamate is used in soup and other dishes that contain comparatively little salt.

The meatlike taste diminishes when vinegar is added to a solution of monosodium glutamate. Probably this is due to the fact that the free glutamic acid formed upon acidifying is not appreciably dissociated to furnish ($C_5H_8NO_4$) ions. The taste of very dilute solutions, such as those used for the threshold value test, is not meatlike, but sweet. The sweet taste of cane sugar is, however, different from that of monosodium glutamate; the sweet taste of cane sugar is greatly intensified when the concentration of the solution is increased.

Manufacture in Japan and China

In China and Japan monosodium glutamate is manufactured on a commercial scale and consumed as a condiment. It is perhaps the only metallic salt of glutamic acid that is non-poisonous and can crystallise well. The pure salt is perfectly white, nearly odourless, and non-deliquescent. The commercial product is usually somewhat hygroscopic when the humidity is high, and has a faint odour resembling that of dry casein if kept in closed vessels. Other salts of glutamic acid in which only one hydrogen is displaced by metal, such as monopotassium glutamate, $KC_5H_8NO_4$, acid calcium glutamate, $Ca(C_5H_8NO_4)_2$, etc., can also be used for the same purpose. But as most of these salts are difficult to crystallise and are deliquescent in moist air, they are less suitable for general use than the monosodium salt.

Ikeda and Suzuki's first patent was granted in 1908. In the following year they filed an application for a United States patent, which was granted in 1912. A United States patent was granted to Graf, of Germany, in the same year, though Graf's product is only a solution of impure monosodium glutamate derived from casein.

Uses as a Condiment

To improve the taste of their food, it is the general practice of the Japanese to add shavings of a certain kind of dry fish. In the specification of Ikeda's first Japanese patent he laid emphasis on the superiority of monosodium glutamate over dry fish as a condiment. Ikeda's product is known under the commercial name "Ajinomoto," or in English "the element of taste," and is manufactured on a large scale by S. Suzuki and Co. There also exist in Japan a number of monosodium glutamate manufacturers of minor importance. Japanese chemical condiments under the trade names of "Ve-tze-sin," "Gluta," "Aji," and "Chuyu" are also known on the Chinese market. Ajinomoto is very popular in Japan, and its production has developed into an industry of great importance.

Meat diet is condemned by Buddhists. In the Far East, and particularly in China, the large number of vegetarians creates an unusually large demand for monosodium glutamate. The restaurants in China, which formerly depended on the more expensive chicken and meat extracts to impart taste to their dishes, have also turned to this modern condiment. In recent years this product has become so popular that it is freely used like salt and sugar in the average Chinese home.

The manufacture of monosodium glutamate was started

in China about eight years ago. There is no official record of the quantities either imported from Japan or manufactured in China, but the data in Table I, given by a leading expert in the industry, are of close approximation.

TABLE I.—VALUES OF CHEMICAL CONDIMENT IMPORTED FROM JAPAN AND MANUFACTURED IN CHINA.

Year.	Chinese Manufacture. $	Imported from Japan. $	Total. $
1924	200,000	300,000	500,000
1925	350,000	700,000	1,050,000
1926	500,000	700,000	1,200,000
1927	500,000	700,000	1,200,000
1928	630,000	500,000	1,130,000

In the tropics people live principally on a vegetable diet, and they resort to monosodium glutamate to improve the flavour of their simple food. The export of Chinese-made monosodium glutamate to the Dutch Indies, Singapore, the Philippines, etc., is developing into a trade of great promise. Ajinomoto is consumed to some extent in France, and the United States.

The wholesale price of monosodium glutamate varies with the manufacturer and also with the size of the packing The average price is $2 to $3 (U.S. currency) for one-pound tins.

Commercial Production

The production of glutamic acid in America and Europe is restricted to the pure product intended for research purposes. The price given by one of the American leading manufacturers of organic chemicals is $15 per 100 grams. Crude monosodium glutamate is manufactured in the West in the form of solution and paste, but not in the solid state.

Ikeda is the pioneer in the commercial production of solid monosodium glutamate. Through his efforts the cost of production has been so reduced that a product containing about 84 per cent. of actual monosodium glutamate is put within the reach of all. His original patents of 1908 and 1912 described several processes. Gluten and soya bean are the preferred proteins, and hydrochloric or sulphuric acid the hydrolysing agent. When the hydrolysis is carried out with sulphuric acid, the hydrolysing agent is removed as calcium sulphate by the addition of lime. The final product may be either a solution or a solid.

Esters

In 1917 Yamamoto obtained a Japanese patent covering a new condiment. By hydrolysing fish or other animal protein separately with acid and alkali, and combining the products, esters of amino acids are formed. Such esters are claimed to possess better and stronger flavours than monosodium glutamate.

In 1921 Suzuki and Yamamoto correlated the original Ikeda and Yamamoto processes. A patent was granted in 1923. The correlation is briefly as follows: Fish, or similar material, is first hydrolysed with alkali, the residue again hydrolysed with acid, and the resulting products are combined. The combined solution is purified and concentrated to about 20° Bé. Five parts or more of this solution are added to 95 parts of a 20 to 30° Bé. solution of monosodium glutamate. The mixture is kept warm for some time, when complicated reactions proceed resulting in the formation of histidine glutamate and other amino acid esters, which are said to improve the flavouring quality of the product. Unlike the product of purely animal origin, such a combination is crystallisable.

In 1912 Ikeda and Suzuki patented a process in the United States for the separation of glutamic acid and other products of hydrolysis from one another by electrolysis. Hydrolysis of protein yields three classes of products, namely, those of decided basic character, those of pronounced acid nature, and those neutral and amphoteric compounds whose basic and acid properties are nearly balanced. Glutamic and aspartic acids, which contain one amino and two carboxylic groups, are acid and belong to the second class of compounds. The hydrolysis product, after the removal of free acid, is placed in an electrolytic cell, which consists of three compartments separated from one another by diaphragms. An electrode is placed in each outer compartment. When electrolysis has been carried out for a sufficient length of time, the bases are found accumulated in the cathode compartment, and the glutamic acid, aspartic acid, etc., are collected in the anodic space as salts of the anode metal. The greater part of the amphoteric amino acids remains in the middle compartment. The solution in each compartment can be separately worked up.

Beetroot Molasses

Beetroot molasses is a promising source of glutamic acid (1, 2, 5, 8, 9). Calculating on the dry solids of the molasses, the yield of glutamic acid is approximately 7 per cent. Glutamic acid and salts can also be obtained from schlempe, a by-product of the manufacture of alcohol from beetroot molasses. According to Ikeda, when schlempe is hydrolysed with sulphuric or hydrochloric acid, the glutamic acid is converted into the sparingly soluble calcium salt, which separates and can be converted into a more soluble salt by the action of carbon dioxide in the presence of water.

The processes of the Chinese manufacturers are different from those of the Japanese in many important respects. The Chinese processes are simple and direct, and require no complicated or expensive equipment; but, nevertheless, an unusual efficiency is achieved by them.

In general, the Chinese processes have the following points in common: Gluten and concentrated hydrochloric acid are placed in a stoneware vessel provided with a reflux condenser, and heated over an oil bath at a moderate temperature until the protein in the gluten is dissolved. The temperature of the oil bath is then raised and the acid kept boiling until hydrolysis is complete, as indicated by the biuret test. The product is filtered, the glutamic acid hydrochloride crystallised and purified, and finally neutralised with soda. The monosodium glutamate so obtained is crystallised, dried, and ground to a fine powder. Commercial hydrochloric acid contains arsenic, which is usually removed from the finished product.

Recent Advances

The improvements made by Pao-Nien Wu, technical director of the Tien-Chu factory, are of special merit. They include the solution of gluten in hydrochloric acid at moderately elevated temperature below the coagulating point of the protein, the use of metallic tin as a catalyst, and the precipitation of monosodium glutamate by alcohol. Tin as a catalyst, when used in the form of small granules, not only hastens the hydrolysis, but increases the yield of glutamic acid, removes arsenic, and lightens the colour of the crude monosodium glutamate.

Chinese manufacturers have made no attempt to use animal protein, since the majority of the consumers of this condiment in China refuse to accept any food product suspected to be of animal origin.

Osborne and his associates (6) have shown that the hydrolysis of gliadin, glutenin, and leucosin yields 5·11, 4·01, and 1·41 per cent. of ammonia respectively. Ammonium salts should not be present in the condiment. Braun, Luithlen, and Neumann (4) claim that a combination of sulphuric and hydrochloric acids as hydrolysing agent produces the best results.

Problems of Chinese Manufacturers

The chief problem confronting the Chinese manufacturer is the shortage of raw materials. The demand for wheat starch is limited in China, and the chemical condiment manufacturers are often forced to reduce their production on account of the shortage of gluten. To manufacture gluten and to convert starch into dextrin, glucose, caramel, alcohol, maltose, etc., are new schemes under careful consideration by at least two prominent manufacturers. The Chinese wheat kernel contains but little protein, and Canadian wheat flour is the source of gluten. Although there is in Shanghai one company producing hydrochloric acid, the output is so small that the manufacturers of chemical condiment have to depend chiefly on Japanese supply.

Literature Cited

(1) Andrlik, *Z. Zuckerind. Böhmen*, 27, 665 (1903).
(2) Andrlik, *Ibid.*, 39, 387 (1915).
(3) Andrlik and Velich, *Ibid.*, 32, 313 (1908).
(4) Braun, Luithlen, and Neumann, U.S. Patent 1,073,392 (1913).
(5) Habermann, *Ann.*, 179, 248 (1875).
(6) Osborne and Clapp, *Am. J. Physiol.*, 17, 231 (1906).
(7) Ritthausen, *J. prakt. Chem.* (1) 106, 445 (1869); Ritthausen and Krensler, *Ibid.* (2) 3, 314 (1871).
(8) Scheibler, *Ber.*, 17, 1725 (1884).
(9) Stoltzenberg, *Ibid.*, 46, 557 (1913).

Overseas Chemical Trade for September

Revival of Exports

THE Board of Trade Returns for September indicate that imports of chemicals, drugs, dyes and colours for the month were valued at £1,261,035, an increase of £99,696 on September, 1928; exports were valued at £1,901,476, an increase of £75,696; and re-exports at £59,550, a decrease of £4,796.

For the nine months ended September 30, imports were valued at £12,169,759, an increase of £761,042 on the corresponding period of 1928; exports were valued at £18,943,491, an increase of £75,885; and re-exports at £723,259, an increase of £4,084. The detailed figures are as follows:—

Imports

	Quantities Month ended September 30,		Value Month ended September 30,	
	1928.	1929.	1928.	1929.
			£	£
CHEMICAL MANUFACTURES AND PRODUCTS—				
Acid Acetic .....tons	1,077	2,285	47,068	80,533
Acid Tartaric.....cwt.	2,159	2,183	9,385	15,042
Bleaching Materials ,,	8,139	12,622	6,397	12,842
Borax..... ,,	18,703	27,383	16,093	15,588
Calcium Carbide .. ,,	78,604	67,875	47,644	40,427
Coal Tar Products value	—	—	66,445	6,474
Glycerine, Crude ..cwt.	23,403	2,073	46,623	4,438
Glycerine, Distilled ,,	307	981	973	2,345
Red Lead and Orange Lead..... cwt.	2,728	3,003	3,707	4,551
Nickel Oxide ..... ,,	98	64	446	299
Potassium Nitrate . ,,	6,584	14,392	6,718	13,415
Other Potassium Compounds .....cwt.	250,466	581,656	77,451	131,920
Sodium Nitrate .. ,,	143,322	22,556	79,245	8,565
Other Sodium Compounds .....cwt.	38,321	45,169	28,900	31,992
Tartar, Cream of .. ,,	2,953	2,733	13,097	12,062
Zinc Oxide .....tons	830	1,072	24,818	31,211
All other Sorts....value	—	—	188,984	325,984
DRUGS, MEDICINES, ETC.—				
Quinine and Quinine Salts .....oz.	140,368	109,768	10,265	8,169
Bark, Cinchona, etc. cwt.	1,169	1,090	6,433	7,111
Other Sorts .....value	—	—	101,625	150,676
DYES AND DYESTUFFS—				
Intermediate Coal Tar Products.....cwt.	130	47	1,087	700
Alizarine ..... ,,	51	54	2,002	1,530
Indigo, Synthetic . ,,	—	—	—	—
Other Sorts ..... ,,	2,998	3,959	72,541	85,119
Cutch ..... ,,	4,050	4,095	6,797	7,159
Other Dyeing Extracts cwt.	3,960	2,789	11,216	9,770
Indigo, Natural ... ,,	—	—	—	—
Extracts for Tanning ,,	101,072	73,645	121,664	75,097
PAINTERS' COLOURS AND MATERIALS—				
Barytes, ground, and Blanc Fixe ..... cwt.	46,283	46,889	10,072	10,565
White Lead (dry) . ,,	11,640	12,413	18,162	21,739
All other Sorts .... ,,	105,143	103,339	135,511	139,712
Total of Chemicals, Drugs, Dyes and Colours.....value	—	—	1,161,339	1,261,035

Exports

CHEMICAL MANUFACTURES AND PRODUCTS—				
Acid Sulphuric ... cwt.	7,043	40,890	3,594	7,091
Acid Tartaric ..... ,,	2,144	985	13,930	7,131
AMMONIUM COMPOUNDS—				
Chloride (Muriate) .tons	307	294	6,314	4,299
Sulphate—				
To Spain and Canaries tons	7,339	10,634	68,535	94,181
,, Italy ..... ,,	175	200	1,635	1,664
,, Dutch East Indies tons	127	150	1,221	1,395
,, Japan ..... ,,	13,206	12,246	124,707	110,367
,, British West India Islands and British Guiana tons	730	411	6,731	3,541
,, Other Countries ,,	13,867	15,774	130,926	143,989
Total ..... ,,	35,444	39,415	333,755	355,137

	Quantities Month ended September 30,		Value Month ended September 30,	
	1928.	1929.	1928.	1929.
			£	£
Bleaching Powder (chloride of Lime) ..... cwt.	40,992	46,041	14,244	12,756
COAL TAR PRODUCTS—				
Anthracene .....cwt.	—	—	—	—
Benzol and Toluol galls.	709,325	12,550	49,212	1,374
Carbolic Acid .... cwt.	14,310	18,346	24,692	25,420
Naphtha .....galls.	6,543	4,579	613	476
Naphthalene (excluding Naphthalene oil).cwt.	7,904	3,412	2,853	1,478
Tar Oil, Creosote Oil, etc. galls.	3,108,868	4,107,024	100,886	109,078
Other Sorts .....cwt.	63,559	35,839	35,535	26,759
Total ..... value	—	—	213,791	164,585
Copper, Sulphate of ..tons	609	464	14,381	12,001
Disinfectants, Insecticides, etc. .....cwt.	32,034	34,906	79,850	81,390
Glycerine, Crude .....cwt.	90	5,654	257	12,120
Glycerine, Distilled .. ,,	8,089	16,448	24,873	40,445
Total ..... ,,	8,179	22,102	25,130	52,565
POTASSIUM COMPOUNDS—				
Chromate and Bi-chromate ..... cwt.	1,988	1,245	3,525	2,555
Nitrate (Saltpetre) ,,	1,382	1,263	2,693	2,338
All other Sorts .... ,,	1,729	3,111	12,400	9,900
Total ..... ,,	5,099	5,619	18,618	14,793
SODIUM COMPOUNDS—				
Carbonate, including Soda Crystals, Soda Ash and Bicarbonate cwt.	311,210	436,409	85,233	119,354
Caustic..... ,,	120,520	173,806	81,518	107,003
Chromate and Bichromate ..... cwt.	2,927	2,557	3,994	3,664
Sulphate, including Salt Cake .....cwt.	164,663	180,649	19,012	19,717
All other Sorts .... ,,	40,308	58,452	34,787	64,284
Total ..... ,,	639,628	851,873	224,544	314,022
Zinc Oxide ..... tons	102	96	4,069	3,697
Chemical Manufactures, etc. all other Sorts ..value	—	—	279,457	296,851
Total of Chemical Manufactures and Products...value	—	—	1,231,677	1,326,918
DRUGS, MEDICINES, ETC.—				
Quinine and Quinine Salts .....oz.	211,514	107,967	18,549	10,193
All other Sorts....value	—	—	215,212	203,264
Total ..... ,,	—	—	233,761	213,457
DYES AND DYESTUFFS—				
Products of Coal Tar cwt.	6,359	13,797	50,377	78,134
Other Sorts ..... ,,	8,085	7,537	7,634	8,793
Total ..... ,,	14,444	21,334	58,011	86,927
PAINTERS' COLOURS AND MATERIALS—				
Barytes, ground, and Blanc Fixe ..... cwt.	2,765	3,586	1,652	2,147
White Lead (dry) . ,,	3,139	4,276	6,075	8,678
Paints and Colours, in paste form .....cwt.	37,589	29,837	74,406	57,503
Paints and Enamels Prepared (including Ready Mixed) .....cwt.	39,411	38,564	132,849	119,265
All other Sorts .... ,,	48,590	50,876	87,349	86,581
Total ..... ,,	131,494	127,139	302,331	274,174
Total of Chemicals, Drugs, Dyes and Colours ... value	—	—	1,825,780	1,901,476

Re-Exports

	Quantities Month ended September 30,		Value Month ended September 30,	
	1928.	1929.	1928.	1929.
			£	£
CHEMICAL MANUFACTURES AND PRODUCTS—				
Acid Tartaric.....cwt.	73	176	598	1,354
Borax..... ,,	510	12	534	7
Coal Tar Products value	—	—	12	30
Potassium Nitrate cwt.	74	74	98	115
Sodium Nitrate .. ,,	628	411	323	212
Tartar, Cream of .. ,,	256	467	1,200	2,300
All other Sorts....value	—	—	13,020	17,720
DRUGS, MEDICINES, ETC.—				
Quinine and Quinine Salts .....oz.	22,103	20,272	2,197	2,048
Bark, Cinchona, etc., cwt.	144	332	552	2,738
All other Sorts....value	—	—	31,779	25,425
DYES AND DYESTUFFS—				
Cutch .....cwt.	1,287	1,045	2,120	2,561
Other Dyeing Extracts cwt.	262	74	1,240	1,188
Indigo, Natural ... ,,	40	3	983	55
Extracts for Tanning ,,	1,008	684	986	910
PAINTERS' COLOURS AND MATERIALS.....cwt.	2,237	1,571	8,590	2,641
Total of Chemicals, Drugs, Dyes and Colours ....value	—	—	64,346	59,550

Methyl Chloride Poisoning

An American Report

A RECENT report in an American medical journal of a number of cases of accidental poisoning from methyl chloride gives an account of the symptoms and after-effects of exposure to this gas (*Journal of the American Medical Association*, August 3, 1929, pp. 353-358 : " Methyl Chloride Poisoning from Electric Refrigerators," by Arnold H. Kegel, M.D., William D. McNally, M.D., and Alton S. Pope, M.D.).

Methyl chloride has been responsible for a number of cases of poisoning in the United States, the latest occurring in Chicago. Since August, 1928, 29 cases of poisoning by commercial methyl chloride, with 10 deaths, have been reported from that city. Three of these occurred in a plant where methyl chloride refrigerators were manufactured and the others developed in kitchenette apartments where leaks were discovered in the refrigerating system.

Methyl chloride is a non-corrosive gas with a boiling point of 24° C. It is colourless and transparent in both the gaseous and the liquid state. It is not perceptibly irritating to the eyes or lungs and has a faintly sweet ethereal odour. The chief danger in its use comes from the lack of marked odour or irritating properties, which makes its presence in the atmosphere difficult of detection. The toxic action of methyl chloride has been recognised for many years, but the first report of accidental poisoning from the gas appears to have been made by Gerbis (in 1914), who reported the cases of two machinists who were affected while repairing an ice machine. Nine years later 10 cases of poisoning from the gas were reported by Roth, and in 1926 Schwartz reported 10 cases of poisoning, with 1 death, these cases, which were reported in German medical journals, all having occurred in the repair or installation of commercial ice machines.

In the spring of 1927, 21 non-fatal cases of poisoning were reported among employees of a refrigerator factory in Indiana. In the majority of the Chicago cases a tentative diagnosis of food poisoning was made, in two of the cases strychnine poisoning was suspected, and in five cases metal poisoning. The possibility of methyl chloride poisoning was first suspected in August, 1928, and again in February, 1929, but it was not until June, when three acute cases occurred, that a definite diagnosis of methyl chloride poisoning was made.

Studies by the United States Bureau of Mines have shown that exposures of from 10 to 12 hours to concentrations of the gas as low as 0·12 or 0·15 per cent. are sufficient to produce death in the experimental animals.

In this connection, attention may be drawn to a letter from the managing director of Hedley and Co. (Leytonstone), Ltd., Mr. A. Henning, which appeared in THE CHEMICAL AGE of August 17 (p. 148), under the title " Deaths from Refrigerant Fumes."

British Tar for British Roads

To the Editor of THE CHEMICAL AGE.

SIR,—Sir William Wayland, M.P., has recently called attention to the increasing tendency to use foreign bitumen in place of British tar as a surface-dressing for our roads. Norfolk, Somerset and South Wales have been cited as districts in which bitumen is being extensively used to the detriment of tar.

This change in road-making practice is a very serious matter for such industries as gas, iron and steel, which produce over 2,000,000 tons of crude tar a year as a by-product, and depend, to a large extent, on securing an economic market for their tar output. The coal industry also stands to suffer severely from the fall in the demand for road tar, as is indicated by the fact that the surface-dressing of one mile of road requires 2,000 gallons of tar, which are, in turn, a by-product from 200 tons of coal. It may be stated, therefore, that the economic use of 200 tons of coal in the gas and the steel industries depends on securing a tar order for one mile of road. If this tar order is not forthcoming, the whole delicate adjustment of prices between gas and its by-products (or steel and its by-products) is disturbed, with the danger that, as compensation for the loss of a tar market, the prices of gas and steel will have to be raised, thus producing further difficulties.

No one disputes the statement that a British market for British tar is essential to the gas and steel industries at the present time. For one-third of the total output of tar, the market is provided by the demand for road tar. It is the gradual restriction of this market that is causing so much anxiety in the industries concerned.

On general grounds of policy, therefore, the view might be taken that British tar should be used, to the exclusion of bitumen, for British roads unless there are grave technical reasons to the contrary. As regards price, ease of application and durability, tar is, I believe, at least equal to bitumen as a road-dressing material. Further, it has the advantage that, whereas bitumen becomes smooth and slippery with wear, tar retains a surface which gives an effective grip to motor tyres. Tar, therefore, is essentially the non-skid material for road surfaces. The Ministry of Transport takes the view that either bitumen or tar is suitable as a road-dressing, subject to the material conforming to certain standard specifications.

In the absence of definite commercial and technical advantage on the side of bitumen, there are the strongest grounds for pressing the Ministry of Transport to make the use of British tar a condition of loans from the Road Fund. British roads should be made of British materials. I urge this more especially as the Government policy appears to be to deflect the liquid capital of the nation from productive industry to road making, and it would be a distinct anomaly if that involved employing foreign labour to the exclusion of British.—Yours, etc.,

HENRY PAGE CROFT.

15, Southwell Gardens,
London, S.W.7.

Synthetic Nitrogen Products at Rjukan

THE total production of nitrogen products manufactured at the Rjukan plant, Norway, partly by the Birkeland-Eyde process and partly by the Haber-Bosch process, amounts to 85,000 tons annually. The original plant was built for the operation of the former process, but the new plant, recently completed, uses the Haber-Bosch method. The ammonia produced by the latter process is only partly converted into compounds at the Rjukan plant. Most of it is shipped in tank cars to a new plant at Heroya, on Tidewater, where the process is completed. Professor Halvorsen, chemical director of the Hydro company, states that the Rjukan plant has the cheapest electrical power in the world, but that the German Leuna Werke, using brown coal, has even lower costs. He also states that the cyanamide process, which followed Birkeland-Eyde, is three times as efficient as the latter, while the Haber-Bosch is four times as efficient as the cyanamide. Plants using the first two do so only because they have the equipment for them, and cannot see their way clear to scrapping their plants. With present-day knowledge of the cost and efficiency of the different processes, the Haber-Bosch is said to be the most economical.

Paint Tests and Their Interpretation

Paper Before the Oil and Colour Chemists

THE first meeting of the 1929-30 session of the Oil and Colour Chemists' Association was held at the Institute of Chemistry, Russell Square, London, on Thursday, October 10, when the president, Dr. J. J. Fox, read a paper on "Tests and Their Interpretation."

DR. FOX, who said that in his talk he proposed to let his mind wander, remarked that although testing was more or less easy—perhaps sometimes rather less easy than might be wished—the question was how to interpret tests when they had been completed. If we took, for instance, the straightforward case of a pigment that it was desired to analyse, and supposing it had 50 per cent. of white lead, which complied with the latest B.E.S.A. specification, a little chalk which perhaps got in by accident, some lead sulphate and some ochre, the first thing necessary was to determine the lead sulphate, which might work out at about 0·05 per cent., and had to be translated into white lead.

It was only possible to take the permissible limits laid down by the B.E.S.A. specification, and the result would probably be something like $\frac{3}{4}$ per cent. out between the two extremes. Thus, to start with, the pigment analysis was $\frac{3}{4}$ per cent. out merely as white lead, and it was not known how much carbon dioxide was due to traces of chalk and other things. A quite small error in carbon dioxide could throw the white lead out completely.

Linseed Oil

Another case was that of raw linseed oil. What most people wanted to know was whether it was genuine. It had been said that it was no use worrying about the iodine value, as this showed nothing as to the constitution of a linseed oil. Personally, he did not believe it, and he would put his money on the iodine value every time. If a linseed oil had an iodine value of 130 would it be rejected on the ground that it was not raw linseed oil?

It might be, of course, that the oil was as good as any raw linseed oil could be, and it might be that, in the future, a set of physical tests would be found which would show that the oil was of no use, although it was an excellent drying oil and had beautiful physical properties. For the time being, however, we would have to adhere to the ordinary chemical examination of linseed oil, which consisted of ascertaining the iodine value as well as the saponifiable and sometimes the unsaponifiable, and then make our own judgment as to whether it was a genuine raw linseed oil. That was the kind of method of interpretation, not a difficult one, that had to be adopted.

Chemical versus Physical Testing

These were the kind of things he had allowed his mind to wander on, and the main part of his lecture would be the question of chemical *versus* physical testing, or perhaps rather the interpretation of analyses. The problem was to determine what was being aimed at. In the case of a manufacturer the position was fairly clear, and there was no difficulty in determining the raw materials in his case, but there were large users who wanted to see what they were getting, and they would have a chemical analysis done in some cases; but the position was that when the chemical analyses had been made, how were they to be interpreted?

When he first had to do with the examination of paints the matter was fairly straightforward. In the old days, white lead paste or paste with half white lead and half barytes was bought, and there was no trouble in getting what was wanted and ensuring that the purchaser was getting his money's worth. Things, however, had advanced beyond that now, and it was not quite so easy, because the user, to save labour, bought ready-mixed paints, and that was where the trouble commenced in the chemical laboratory. It was possible to buy ready-mixed paints to a specification which might be described as somebody's XX superfine matt surface. No doubt it was good, but it was not easy to analyse, although it could be done. It was possible to say whether the paint was going to flocculate and whether it had fine particles. The B.E.S.A. specification showed how to do that, but in dealing with pigments he was doubtful whether it was possible really to determine whether they were any good or not.

The difficulties had arisen because, for instance, of the growth of the use of extenders, although they were not called extenders in the early days. These were really adulterants, and to-day white lead paint which had not a proportion of barytes or zinc oxide would not be accepted.

Gloss Paints

All this was straightforward when dealing with a straight oil and pigment paint, without any addition of resins or gums, but when they came to gloss paints, the difficulty really started. He felt that it was safe to say that the analysis of a gloss paint containing so much pigment, so much thinners and so much medium, if not impossible, was getting towards it, and it was necessary to turn to final tests.

The one thing that was required to be known about a gloss or any other paint was its durability. That was the first, second and third requirement in any paint. In the case of a gloss paint it was required to retain its gloss, and the first thing to find out was what was meant by gloss. He believed that Dr. Jordan and his staff were more or less on the way to giving us some definition of gloss that would be satisfactory; in other words, it was becoming possible to measure for the first time what was happening and to indicate when a gloss paint was beginning to fail. Another problem that was almost as difficult with all kinds of paints was what was the colour of the paint, and here again he believed that the Research Association would soon make it possible to be able to say what was meant by the particular colour and how it could be measured.

As to the question of whether there should be chemical tests or physical tests, the obvious thing was to do a little of both. Thirty years ago nobody ever thought of having a physical test of paint; paints were judged entirely by chemical analysis, and that was not so difficult then as now. Since then, the pendulum had swung over, and the physical people had come along and said it was no use messing about with chemical analyses, and so, therefore, it was perhaps useful to have both chemical and physical tests.

Examination of the Pigment

The conclusion he had arrived at, from a consideration of these things for many years, was that it was necessary to examine the pigment of a paint. It was possible to get all the necessary information with regard to the white lead and the thinners, but when it came to the oils and gums it was rather different. If they were fortunate, they would be able to determine the gum and the oil, but he had grave doubts, in spite of what had been done in America and elsewhere, as to the method of examining these media. Therefore, it was necessary to assess the material, knowing what the pigment was, by physical tests such as those devised by the B.E.S.A., and others which had been worked out elsewhere. It was for these reasons that he contended that it was necessary to use chemical and physical tests and that only in rare circumstances was it possible to ignore either.

In conclusion, Dr. Fox said that the main purport of his address was to rub in that the thing which must be ascertained was the measure of durability of paints and varnishes, and it was on that point that he would like some information from some of the members of the Research Association. He did not know of any test that would enable them infallibly or even probably to predict the durability of any mixed paint or varnish, although he believed it could be done. One way in which it had been suggested or done was the method being used by the Research Association. Here, again, however, there were two problems. There was the internal coat and the external coat. In his opinion, there should be two kinds of tests for these, but so far as he knew the tests for durability in both cases were one and the same for all kinds of paints.

In a paper by Walker, of the American Bureau of Standards, the main conclusion was that what was at the bottom of lack of durability of paints and varnishes was the effect of light. For internal work that must be of far less importance than the other factors that led to the breakdown of a surface. Therefore, it was really essential to have two types of durability tests—for internal and external paints.

Indian Chemical Notes

[From our Indian Correspondent]

The Pharmaceutical Society of India, Madras, which held its first anniversary meeting recently, shows very good progress. The aim of the society is to possess a library and a laboratory of its own, and in co-operation with Government to establish teaching centres and award diplomas to enable persons to practise as qualified pharmacists and compounders. In a paper read before the meeting, some measures were advocated to regulate the drug traffic in India and the training of pharmacists. The chairman remarked that it was impossible to control people who sold drugs of every kind in the matter of indigenous systems of medicine. There was only the possibility of a control by Government over the sale of foreign drugs whether produced in India or abroad. A careful inquiry by the Government is, however, in progress.

Forest Research

The Committee appointed by the Government of India to recommend the lines on which research at the Dehra Dun Forest Research Institute should be reorganised, has suggested the creation of an Advisory Board to deal with the general policy of the Institute and to aid the Government in discharging its responsibilities for the effective supervision of work there. Another recommendation is that a Director of Research should be appointed to the Institute, to deal with the more strictly scientific portion of research and in general to guide and co-ordinate investigations. It is further proposed that probationers should be trained in research at the Institute, and selected persons from among them sent for training abroad. Also, for the co-ordination of internal work, it is suggested that a periodical colloquium should be arranged with a view to breaking down the barriers between the various sections of research.

Bamboo Pulp in Burma

The Dehra Dun Institute some time ago deputed one of its staff to survey the possibilities of Burma for the bamboo pulp industry, and his report is now published. The report states that the final solution of the paper makers' recurring problem of supply will only be found in the vast stores of the waste products, chiefly *Gramineæ* of the forest and waste lands of the tropical and sub-tropical belt, of which bamboo is the most important. It is annually self-productive, and may be cropped every fifth or seventh year. Bamboo pulp can also be produced at a cost which will permit its export to Europe. After examining all the details of cost, the author of the report estimates that the standard cost of production c.i.f. Calcutta, would be Rs. 108 a ton, as against the Rs. 188 which has been the average cost of wood pulp c.i.f. Calcutta during the last three years.

Calcutta Imports

The total imports of drugs, medicines, and chemicals into Calcutta in the year 1928–29 amounted in value to Rs. 172 lakhs, as against 168 lakhs in the previous year. The chemicals alone were valued at Rs. 100 lakhs. Soda compounds were worth Rs. 48 lakhs, and sulphur Rs. 10 lakhs. Among drugs, quinine was valued at Rs. 15 lakhs. The value of miscellaneous drugs imported from Germany has dropped from Rs. 13½ lakhs to Rs. 9 lakhs, while imports from the United Kingdom have improved from Rs. 27 lakhs to Rs. 29 lakhs. Both countries have shared in the increase in miscellaneous chemicals, but the United Kingdom continues to provide the greater portion of the supply under all the principal heads, except calcium carbide, of which Norway and Italy are the chief sources.

Imports of Salt

The imports of salt into Calcutta increased from 435,000 tons in 1927–28 to 465,000 in 1928–29, of which 165,000 tons came from Aden, 65,000 from the United Kingdom, 70,000 from Port Said, and 22,000 from Germany. The rise in the price of salt during the previous three years came to end, and a fall took place. As a result, imports from the United Kingdom, Egypt and Spain have decreased, while those from Aden have increased substantially. The principal factors in lowering the prices have been the arrival of cheap cargoes from Tripoli and Roumania, which, in affording the consumer relief in the matter of price, have made up the deficiency in supplies from other sources. A small but promising trade in Karachi sea-salt has been inaugurated.

Exports of Lac

The total quantity of lac exported from Calcutta in 1928–29 amounted to 721,000 cwts., as against 534,000 cwts. in the previous year. Exports to the United States rose from 171,000 to 240,000 cwts., and exports to the United Kingdom from 129,000 to 149,000 cwts. Despite the further increase in exports of stick and seed lac, the exports of shellac and button lac reached the highest figures, both of quantity and value, on record. The United States of America again took as much as ever, while the demand from all the other importing countries increased. Exports of refuse lac have also again increased, Germany and Belgium being almost the only purchasers. Prospects for the current year are not so bright, the Bysaky crop being expected to be much below normal. Out of the total exports of stick and seed lac, amounting to 99,000 cwts., the United States purchased 77,000 cwts.

Exports of Mica

The total exports of mica from Calcutta during the year increased from 69,000 cwt. to 84,000 cwt., but the value fell from Rs. 78 lakhs to Rs. 74 lakhs. The quantity and value of block mica fell from 9,751 cwt., and Rs. 25 lakhs to 8,531 cwt. and Rs. 21 lakhs. The United Kingdom took only 3,000 cwt. of block mica, as against 5,300 cwt. in the previous year, but the quantities exported to the United States and to France increased. The fall in the exports of block mica was more than compensated by the increased exports of mica splittings, which, as in previous years, formed the bulk of the trade. In the year under review, 76,000 cwt. of splittings worth Rs. 53 lakhs were exported as against 60,000 cwt. valued at the same figure.

Synthetic Nitrogen Products in America

Estimates for the Coming Year

The production of fixed nitrogen in the United States this year, according to a statement by Dr. C. H. Kunsman, fertiliser and fixed nitrogen chemist to the U.S. Bureau of Chemistry and Soils, will be three or four times greater than last year. This year's production will be the equivalent of about 600,000 tons of Chilean nitrate, of which the United States has been importing about 1,000,000 tons a year.

For the first time, says Doctor Kunsman, the domestic United States supply of fixed nitrogen becomes an important fraction of the total supply, and also, for the first time, a considerable part of the domestic production will be used as fertiliser, the agricultural demand for nitrogen representing, in one form or another, about two-thirds of the total demand for nitrogen. In establishing the nitrogen fixation industry in the United States, the Government has taken an active part, and the Fixed Nitrogen Research Laboratory of the Bureau of Chemistry and Soils, the research of which has been of great importance in establishing the industry in the United States, is continuing its investigations.

"More than ten years ago," says Dr. Kunsman, "the Government built the Muscle Shoals nitrate plant for war purposes. No fertiliser has been produced there, although the use of the plant for that purpose has been widely advocated. Our increasing supply of fixed nitrogen is coming from new and modern plants constructed by private enterprise."

Peru's Guano Trade

According to the last report of the Peruvian Guano Co., 136,382 short tons of guano were produced in the year ended March 31, 1929. Of this total, 17,618 tons were exported and the balance sold to local agriculturalists. Domestic sales last year exceeeded those of the previous season by 36,724 short tons and were only 3,125 tons behind the record made in 1922. Net profits from domestic sales reached about $1,500,000, a gain of 61 per cent. over the preceding year. The following table shows production for home consumption for the last six years:—

Season	Short Tons.
1923–24	94,960
1924–25	122,565
1925–26	113,986
1926–27	75,458
1927–28	71,558
1928–29	118,764

The Manufacture of Calcium Carbide

(From a Correspondent)

CALCIUM carbide is a generally known commodity because of its extensive use in the lighting of automobiles, for various lamps, and for other minor lighting purposes. It is also used largely in the acetylene process of metal welding. But in modern times, principally in continental lands, it has been used on a large scale in the preparation of cyanamide, which has become an important nitrogenous fertiliser. Other important uses for the carbide are in the production of acetic acid and acetone from acetylene, and for the manufacture of solvents such as carbon tetrachloride. Ethyl alcohol can also be made from calcium carbide, but as the production of a ton of alcohol in this way requires about two tons of carbide and 500 cubic metres of hydrogen, it has not developed as a commercial source of alcohol.

Calcium carbide (CaC_2) was first discovered by Wohler in 1862; it is obtained by heating lime and carbon to fusion point in a suitable form in an electric arc furnace. It may be mentioned that the energy consumption in a carbide electric furnace, where part of the heat is supplied by the arc and part by the resistance in the charge, is much more favourable than, for instance, in an electric furnace used to smelt iron ore. Theoretically, the necessary expenditure of energy should be about 2·8 kw. hours per kg. of carbide produced, but in practice the energy consumption amounts to about 3·7 kw. hours, which indicates an efficiency of about 76 per cent. It is calculated that about three-quarters of the energy lost is heat radiated from the furnace, and that the other fourth is lost in current transmission.

Raw Materials

It was formerly the practice to use a finely-divided mixture of lime and carbon in manufacturing carbide. The lime should be well burnt, as otherwise the electric energy is partly used to complete the burning. To-day the materials employed are used in a relatively coarse condition. The kind of carbon used is a matter of importance; impurities which would injure the product must be excluded as far as possible. Charcoal is a suitable material, but its cost is too great; anthracite, on account of its great density, is not a desirable form of carbon; but coke conducts so well that the heat spreads over a relatively large area in the furnace. A mixture of anthracite and coke is often used. The voltage in the furnace and the energy supplied must be regulated to suit the material used in the charge.

A technical problem is the selection of the most suitable carbon electrodes; these must conduct freely, have little tendency to break, and be only slowly consumed. The electrodes must be suited to withstand water cooling at the temperature of the furnace, about 3,000° C. In large modern furnaces of 8,000 kw., great trouble was caused at first by the breaking of electrodes, which not only resulted in the loss of these expensive appliances, but caused unwelcome interruptions in the furnace operation. To avoid this trouble the fine-texture electrodes were replaced by electrodes made up of relatively coarse anthracite, in which there is far greater elasticity.

Suspension of Electrodes

In modern furnaces a rotatory current is used, and therefore three electrodes are suspended in the furnace. The suspension and the contact of electrodes to carry a high current was comparatively simple in the smaller furnaces formerly used. The strength of the current amounted to only a few thousand amperes, and the weight of the electrodes did not exceed 150 to 200 kg. But with the introduction of bigger units, and the necessity of using electrodes of about 700 kg., the difficulty of suspension and contact became considerable. Without a good contact the transmission of energy to the electrode creates enough resistance to heat the head of the electrode to a glowing temperature, so that it commences to burn. This burning increases the difficulty and tends to injure the contact. The contact method has been modified in many ways, but even now the difficulty has not been entirely overcome. A loading of 40,000 amps. at 160 volts requires that the contact be kept cooled, and this is accomplished by circulating cold water through hollow bolts and contact plates. As the high loading of the electrodes with current brings the electrode up to a glowing heat in places where it is not covered by the charge, it is now the practice to protect these parts with a layer of fire-clay, asbestos, or the like, which protective layer is maintained in place with a coarse mesh iron wire or a thin iron sheet.

Operation of Furnaces

In the large furnaces which operate continuously, from 500 to 800 kg. of carbide are withdrawn every hour. In order to guarantee the quality of the material sold, every batch is separately analysed. The quality can also be judged to some extent by the external appearance and by the fracture. The colour may be brass-yellow, blue, or reddish.

The electric furnace operates quietly with an excess of lime present in the charge, but tends to be disturbed if, in order to obtain a high-grade carbide or to protect the electrodes, an excess of carbon in the charge is present. With suitable raw material, the operation of the furnace can be adjusted by adding lime or carbon as may be necessary, and also by regulation of the electric current.

A large furnace of the modern type should work for years continuously, without shutting down for serious repairs, if properly handled. Moreover, the furnace can also be operated at considerable under- or over-load. It can also be operated with frequent working pauses, so that it is possible to use the cheap night current of power works for carbide manufacture, although often cheap hydro-electric power is used. The first plant which was erected to use the night current instead of the hydro-electric current was built at Langenbrugge, in Belgium. It came into operation in 1926, with a daily capacity if about 20 tons of carbide, or roughly 5,000 tons yearly. This was the first carbide manufacturing plant erected in Belgium, and its annual output amounts to about half the 10,000 tons a year formerly imported by Belgium.

The carbide, as it is withdrawn from the furnace, is taken to cooling floors, and the cooled material then goes to breakers and mills. The broken material is graded by sieves into sizes suitable for the purpose for which it is to be used, and then packed into steel drums. For the production of calcium cyanimide ($CaCN_2$), for fertilising purposes, the carbide is milled to an extremely fine powder in closed-in mills. The daily output of carbide per kw. day is from 6 to 7 kg.; an 8,000 kw.. furnace has a daily capacity of about 50 tons of carbide.

New Benn Publications

THE announcements of new books by Ernest Benn, Ltd. include the following:—

The New Despotism. By the Rt. Hon. Lord Hewart of Bury (21s.). That a Lord Chief Justice has found it necessary to examine the encroachments of bureaucracy on the private liberties of the citizens of this country demonstrates the exceptional importance of the question with which he deals.

The Jews in the Christian Era, and their Contribution to its Civilisation. By Laurie Magnus, M.A. (15s.) Mr. Magnus gathers into one volume the scattered threads of the Jewish contribution to the common stock of our modern civilisation.

An Encyclopædia of the Ceramic Industries. Volume I. By A. B. Searle. (Post 4to. Cloth. 392 pp. Illustrated. 9 guineas the set of three volumes.) A guide to the materials, methods of manufacture, means of recognition and testing of the various articles produced in the clayworking and allied industries.

Climate. By C. E. P. Brooks. (10s. 6d.) The first compact and authoritative account in English of the distribution of climate over the surface of the earth.

Self and Society Series. 6d. each.—*Labrador's Fight for Economic Freedom.* By Sir Wilfred Grenfell.—*The Consumer in History.* By A. Elizabeth Levett.—*Art and Everyman.* By Ivor Brown.—*Capital, Labour and the Consumer.* By G. W. Daniels, M.A., M.Com.—*Old and New Japan.* By Kiyoshi Ogata, Ph.D. (Econ.).—*Agriculture—Industry's Poor Relation.* By G. Walworth, M.A.

Sterilisation of Swimming Baths

A Notable Plant at Greenwich

ONE of the latest examples of the complete revolution that is now being effected in swimming bath practice, based essentially on continuous sterilisation by means of chlorine gas, is a new installation in London at the Borough of Greenwich Public Baths, at Trafalgar Road, Greenwich.

The accommodation consists of a first-class swimming bath and hall, having a swimming pool 100 ft. long and 40 ft. wide, while the second-class swimming pool is 80 ft. by 40 ft. In addition, there is a ladies' swimming bath 70 ft. by 38 ft., collapsible teak dressing boxes, with foot and spray baths and lavatory accommodation in separate rooms off the main halls, and 74 slipper baths.

Water Purification Plant

The water purification plant and equipment has been supplied throughout by the Paterson Engineering Co., Ltd., there being two separate installations, one dealing with the water in the first-class bath, and the other with the combined second-class and ladies' baths.

As regards the first-class swimming pool, which holds 131,250 gals., the contents are completely circulated every four hours, at the rate of 32,813 gals. per hour, through strainer apparatus for coagulant treatment with aluminoferric, cleaned with compressed air, having a filtration area of 170 sq. ft., and a rate of 193 gals. per sq. ft, per hour. Similarly, the combined contents of the second-class and the ladies' baths, a total of 169,812 gals., are circulated through a separate purification plant at the rate of 42,453 gals. per hour, including four 8 ft. 6 in. diameter sand filters having a filtration area of 226 sq. ft., operating at a filtering speed of 187 gals. per sq. foot per hour.

Chlorine Treatment

The equipment further includes electrically-driven circulating pumps, two "Chloronomes" for the addition of a measured trace of chlorine gas (about 1 part per 2,000,000 parts), and a tubular type calorifier, while the enclosed type of aerator used is supplied with compressed air by small electrically-driven rotary compressors, the air and the water coming into contact as they rise upwards through the aerator. An important feature is that excess air entrapped in the bath water is liberated to the atmosphere by a vent pipe at the top of the aerator. In the usual way, the water is taken away from the deep end of the bath, and after passing through the circuit continuously, is discharged again at the shallow end by means of three separate inlets each fitted with valves, the movement of the water being imperceptible to the bathers. In this way the same water can be used for several hundred thousand bathers, covering a year's running or over, and still remain absolutely clear, sparkling, and entirely free from every trace of obnoxious bacteria, so that no diseases can be carried by it.

Graesser-Monsanto Salesmen's Dinner

SOME fifteen members of the sales force of Graesser-Monsanto Chemical Works, Ltd., attended a dinner on Monday evening, October 7, at the Florence Restaurant, Coventry Street, London. This occasion was the more interesting for the presence of Mr. John F. Queeny, chairman of the company.

Major T. Knowles, director of sales, took the chair, and in proposing a toast to Mr. John F. Queeny and the Graesser-Monsanto Co., expressed the keen pleasure experienced by all present at having Mr. Queeny as the guest of honour. Major Knowles, in a few well-chosen words, summed up the feelings of all members, and referred to the spirit of co-operation through the organisation, which was backed by determination to make progress.

Mr. Queeny, in a brief reply, said that he was glad to be present at the gathering, and that he felt certain of a successful issue to the combined efforts that were being put forward. He believed that the resources of the company, together with the experience gained in over sixty years of chemical manufacture, would enable them to maintain the excellence of their products, and to continue to give satisfaction to consumers.

An interesting musical programme was contributed by various members.

China Clay Imports—September, 1929

A RETURN showing the quantities and value of China Clay, including China Stone, imported into Great Britain and Northern Ireland, as registered in the month of September, 1929, is as follows:—

COUNTRIES WHENCE CONSIGNED.	QUANTITY. Tons.	VALUE. £
Sweden	15	59
Germany	35	161
U.S. America	10	79
Total	60	299

China Clay Exports—September, 1929

A RETURN showing the quantities and values of the exports of China Clay, including Cornish or China Stone, the produce of Great Britain and Northern Ireland, from Great Britain and Northern Ireland, as registered in the month of September, 1929, is as follows:—

COUNTRY OF DESTINATION.	QUANTITY. Tons.	VALUE. £
Finland	872	1,877
Estonia	334	567
Latvia	222	406
Sweden	2,302	4,666
Norway	870	1,311
Denmark	414	1,259
Germany	3,280	7,221
Netherlands	1,712	4,083
Belgium	6,192	11,316
France	3,667	7,431
Switzerland	43	133
Spain	1,590	3,362
Italy	3,100	7,242
Turkey, Asiatic	10	21
China	25	126
United States of America	28,557	61,897
Mexico	5	22
Chile	50	200
Irish Free State	—	3
Palestine	—	2
Union of South Africa	—	14
British India, *via* Bombay	577	2,494
Via Madras	40	167
Via Bengal, Assam, Bihar and Orissa	160	657
Via Burma	—	1
Australia	42	177
Canada	1,099	3,111
Total	55,163	120,266

Potash from Polyhalite and Greensands

CONSIDERABLE progress in the investigation of proposed processes for the extraction of potash from such minerals as Texas polyhalite, Wyomingite and New Jersey greensands is being made at the non-metallic minerals experiment station of the United States Bureau of Mines, Department of Commerce, New Brunswick, N.J. Arrangements have been made with one of the leading manufacturers of sand-lime bricks to make tests on the residues from New Jersey greensands for the purpose of making building bricks. A new chemical engineering laboratory is nearing completion, where these processes can be tested on a scale that is commensurate with pilot plant production. After digestion of the greensands under high pressure for the extraction of the potash, the residue will be properly treated and furnished for the brick testing purposes in 200 and 300 lb. lots. Shipments of polyhalite and Wyomingite have been received, and work on these minerals in digestors and extractors of larger size than those used in the chemical laboratory will be in progress within a very short period of time. During the course of these investigations it has been found necessary to make some equilibrium measurements of various systems of potash and magnesia or soda salts in saturated aqueous soluton. Equilibrium in the system potassium sulphate-magnesium sulphate-water has been measured at 30° C., and measurements at 85° C. and 100° C. are in progress. These measurements are essential before any accurate flow-sheet for the treatment of polyhalite extracts can be constructed.

I.C.I.-I.G. Patent Action

Case Fixed for November 20

MENTION was made in the Chancery Division, on Tuesday, of the case of Imperial Chemical Industries, Ltd., against the I.G. Farbenindustrie Aktiengesellschaft, in which the plaintiffs ask for the revocation of three letters patent for certain dyestuffs.

Mr. Whitehead, K.C., applied for the fixing of a date for the hearing of the action. He said it was a substantial matter, and the case would occupy about three weeks.

Mr. Justice Maugham said he had been thinking over the matter, and had had an opportunity of consulting his colleagues upon it, and was considering if this was not a case suitable to have tried with an assessor, in the hope that a considerable amount of public time would be saved. The Act of 1907 contemplated that it should be done, and he thought this was a case when the Court had to consider questions with which it was unfamiliar. He asked Mr. Whitehead and Mr. Stafford Cripps, K.C., representing the other side, to see if they could not agree upon an assessor who could sit with him. The Act also provided for the cost of any assessor appointed in a patent action, and there ought to be no difficulty about that.

Mr. Cripps said the difficulty was in finding a gentleman to whom both sides would agree.

His Lordship said the Act of 1907 contemplated such an appointment, and now patents were so long and complicated he thought he was entitled to try it as an experiment and see how it worked. He should like the parties to agree upon an expert, and, in the event of their being unable to do so, he could take action himself.

Mr. Whitehead intimated that he would suggest a name to Mr. Cripps. He was a gentleman who was an officer of the State, and would never be called upon to give evidence.

Eventually the date of hearing was fixed for November 20. Meanwhile the parties would endeavour to put the name of an assessor before his Lordship.

Food and Drugs Act Prosecution

Case Dismissed

THE Sheffield Magistrates were asked on Wednesday to fix a standard of pepper compound.

The case was one in which Hughes and Co., Ltd., of 23, College Hill, London, were summoned in respect of a pepper compound sold by them as principals to Sam Rowland Dewire; that they unlawfully gave a false warrant in writing that the compound was of the nature, substance and quality described, and fulfilled all requirements of the Sale of Food and Drugs Acts and of the Public Health Regulations.

Mr. W. A. Williams (prosecuting) said that samples of the compound were bought on Dewire's premises. The mixture contained 50 per cent. pepper and 50 per cent. ground rice flour, which it was alleged was a fraudulent mixture. The rice flour would act as a diluent, and would interfere with the preservative qualities and the flavour and pungency of the pepper. There was no standard on which to base the mixture, but the Bench were asked to fix such a standard.

Mr. John Evans, city analyst of Sheffield, said the pepper compound should contain pepper and ingredients with similar characteristics. There were no such properties in rice flour. He could not suggest what should be set up as a standard. Cross-examined by Mr. F. W. Scorah (for the defence), witness admitted that there were traces of other ingredients in the compound, including capsicum.

Mr. Ernest John Parry said it was inaccurate to describe the compound as a 50-50 mixture, for it contained amongst other ingredients capsicum, which was 500 to 1,000 times more pungent than pepper. The rice flour was impregnated with substances which had the characteristics of pepper.

The magistrates were of opinion that the case had not been made out, and dismissed the summonses.

Appointments Vacant

CHEMIST, conversant with the manufacture of anthraquinone, alizarine and vat colours, for an American colour works. Details on p. xxiii.

ANALYTICAL WORKS CHEMIST to take charge of research laboratory. Details on p. xxiii.

Compressed Gases as Airship Fuel

The Case of the *Graf Zeppelin*

AN important problem confronting the designers and operators of lighter-than-air craft is to keep the lift of the ship approximately constant at all times, although the weight of fuel is constantly diminished as it is consumed during the cruise. This could be accomplished by valving off part of the levitating gas, but as it is a costly and wasteful process, means have been found to avoid it.

In the case of the United States airship *Los Angeles*, which is helium-filled and uses gasoline as fuel, the lift of the ship is kept constant by condensing the water of combustion from the exhaust gases of the motors. The *Graf Zeppelin*, however, uses hydrogen as the levitating gas, because hydrogen is much more easily obtainable than helium and has greater lifting power. A gas, carried in separate balloonettes in the interior of the ship, supplies fuel for the motors. The lift of the ship is kept constant by using a fuel gas having approximately the same specific gravity as air. Thus the load is not diminished as the fuel gas is consumed.

Blau Gas

The *Graf Zeppelin* was fueled at its home port, Friedrichshafen, with Blau gas. This gas, which is produced by cracking oil, is extremely suitable, as it has about the same specific gravity as air and high fuel value. Since this gas is not available at other places, different arrangements had to be made at the other airports at which it was proposed to refuel on the globe-circling flight of the German airship.

Chemists of the Linde Air Products Co. and the Carbide and Carbon Chemicals Corporation, both units of the Union Carbide and Carbon Corporation, were consulted as regards the manufacture and use of fuel gases. They expressed the opinion that ethane would be the ideal gas to use, as it is about the same weight as air and has a very high fuel value. Sufficient ethane for the first leg of the cruise, from Lakehurst to Friedrichshafen, was accordingly sent to Lakehurst, compressed into steel cylinders, from the Carbide and Carbon Chemicals Corporation plant in West Virginia. Ethane was successfully used on the first leg of the flight. Upon its return to Friedrichshafen the dirigible was refueled with Blau gas for the flight to Tokio.

Pyrofax

But economic as well as scientific considerations being an important factor, Pyrofax, mixed with hydrogen, was used as a fuel for the third leg of the cruise from Tokio to Los Angeles. Pyrofax, which is also manufactured by the Carbide and Carbon Chemicals Corporation, is best known as a fuel gas for gas ranges in rural homes or in districts not served by city gas mains. It is not as suitable as ethane for use in the Zeppelin, being somewhat heavier than air, but as it is easily liquefied at comparatively low pressure it could be shipped to Tokio from West Virginia in a much smaller number of cylinders than could ethane, and at proportionately less expense. It was therefore used, mixed with sufficient hydrogen (locally obtained) to make the specific gravity of the mixture approximately the same as that of air.

For the last leg of the flight, from Los Angeles to Lakehurst, Pyrofax was again used. This time it was shipped from West Virginia in tank cars, thus further reducing the cost of transportation. At Los Angeles, the Pyrofax was mixed with a suitable volume of California natural gas to make the specific gravity of the mixture approximately the same as that of air.

British Metal Merger

NEGOTIATIONS have been proceeding for a fusion of interests between the British Metal Corporation and Henry Gardner and Co., Ltd., and it is proposed to form a holding company, which it is hoped will acquire the shares of both companies. Each company is maintaining its separate organisation. The terms tentatively arranged are as follows:—Preference shareholders in the British Metal Corporation will be offered similar preference shares in the holding company. Ordinary shareholders in the British Metal Corporation will be offered 200 ordinary shares in the holding company in exchange for 100 British Metal Corporation ordinary shares. Ordinary shareholders in Henry Gardner and Co., Ltd., will be offered 160 ordinary shares in the holding company, in exchange for 100 ordinary shares of Henry Gardner and Co., Ltd.

From Week to Week

MR. HARRY J. NEWMAN has been elected Master of the Worshipful Company of Distillers.

MR. TREVOR JOCELYN MATTHEWS has been elected Prime Warden, and Mr. James Henry Nelson Curtis, Renter Warden, of the Dyers' Company.

LORD MELCHETT has offered the Royal College of Surgeons £500 a year for seven years for a Research Scholarship, and the gift has been accepted.

THE PAPER on "The Development of printing processes and printing ink," by T. Hedley Barry, originally fixed for Thursday, November 14, at a meeting of the Oil and Colour Chemists' Association, will be presented instead on Thursday, November 28.

THE BY-PRODUCT PLANT now being erected by the British Benzol and Coal Distillation Co., at Bedwas, Mon, is expected to be completed next month, and to be in full operation in December. Tests have already been carried out and these have proved satisfactory.

MME. CURIE arrived at New York in the liner *Ile de France* on Tuesday to accept from a group of American women a gift of £10,000, subscribed by them for a gramme of radium. She proposes to give the radium to the new Radium Institute at Warsaw, Poland, the land of her birth.

DR. C. V. DRYSDALE, D.Sc., superintendent of the Admiralty Research Laboratory, has been appointed Director of the Scientific Research and Experiments Department of the Admiralty. He succeeds Dr. F. E. Smith, F.R.S., who has taken up the appointment of Secretary to the Department of Scientific and Industrial Research.

GROUND RED OXIDE OF IRON and crude red oxide exported from Malaga, Spain, during the quarter ending June 30, amounted to 4,123 and 2,922 metric tons net, respectively. The United States purchased 40 per cent. of the ground but none of the crude, which went chiefly to France and Germany.

AN EXTRAORDINARY GENERAL MEETING of shareholders of the British Safety Glass Co. will be held at the offices of the Incorporated Accountants' and Auditors' Society on Wednesday, October 23, at twelve o'clock, to consider resolutions authorising the increase of the capital to £150,000 by the creation of 500,000 new ordinary shares of 2s. each. These new shares will rank *pari passu* with the existing ordinary shares.

SIX FLOORS OF A HUGE WAREHOUSE on the docks at West Hartlepool collapsed on Friday, October 11, under the weight of thousands of tons of sulphate of ammonia which had been stored in the building. The warehouse belongs to the London and North Eastern Railway Co. and was originally built when Hartlepool was a big grain centre. It had been nearly empty for fifteen years. The portion affected is about one-third of the whole area of the warehouse and steps are being taken to prevent further collapses. No personal injuries were sustained.

THE MINISTER OF HEALTH and the Minister of Transport, on Tuesday, received a deputation from the London County Council upon the question of the proposed Battersea Power Station. The Ministers, while indicating that they could not be indifferent to electrical needs, stated that the Government would certainly insist upon everything practicable being done for the protection of the public. A widespread opposition has been offered to the station on the ground that sulphur fumes will be a danger to public health and property. The London County Council has withdrawn its opposition to the scheme.

VICKERS-ARMSTRONG, of Barrow, announce the discovery of a new alloy which promises to be of far-reaching importance, which has been made by the foundry superintendent and a metallurgist at the Barrow works. The alloy is a substitute for metallic tin, and its manufacture is now in progress after many months of research. This tin substitute is being used as a hardener for copper in the production of engineering and shipbuilding alloys, such as brasses and bronzes, where tin was previously employed. It is stated that the discovery is of considerable technical and economic significance, and will become a highly important factor in the engineering industries in the future.

MR. E. A. CAPPELEN SMITH, the president of the Anglo-Chilean Consolidated Nitrate Corporation, mentions in a statement just issued that the final steps in the plans for the recapitalisation of the Lautaro Nitrate Co., for the introduction of the Guggenheim process, and for the financing incident to the construction of the new plant were taken on October 15. The Anglo-Chilean Corporation will supervise the construction of the new plant, and orders for machinery and materials will be placed immediately. It is expected that the work will be completed in about two years. With regard to the "no par value" shares of the Lautaro Nitrate Corporation, which are to be distributed among the shareholders of the Lautaro Nitrate Co., it was estimated in the prospectus issued in connection with the sale of the Lautaro bonds, that, with the new plant operating at full capacity, the net earnings of the Lautaro Co. would be equivalent to $1.66 per share of Lautaro Nitrate Corporation common stock. In reaching this figure the deduction for depreciation and depletion was more than 70 cents per share.

PATENT RESEARCH, INC., announce the removal of their offices to the Lefcourt-National Building, 521, Fifth Avenue, New York.

A PROVISIONAL AGREEMENT has been reached between Dorman, Long and Co. and Bolckow, Vaughan and Co. for a fusion of interests by means of an exchange of shares.

THE MARRIAGE took place on Monday of Miss M. H. D. Carr, B.Ch., daughter of Dr. F. H. Carr, and Mr. E. R. Gunther, M.A., zoologist on the staff of the *Discovery* expedition, son of Dr. R. T. Gunther, of Oxford.

AN ESCAPE OF CHLORINE from a cylinder, at the headquarters of the British Research Association for the Woollen and Worsted Industries, at Torridon, Leeds, on Friday, October 11, resulted in the gassing of two attendants and two firemen, who were detained in the Leeds Infirmary.

MR. WILLIAM L. COOPER, U.S. Commercial Attaché in London, has been selected to succeed Mr. Julius Klein as director of the Bureau of Foreign and Domestic Commerce, Washington. Mr. Cooper has been in London three years, having replaced Mr. Walter S. Rower in October, 1926.

A NEW TYPE OF SHIP has been designed by the Aktiebolaget Svenska Ostasistiska Kompaniet, of Gotenburg. The ship is fitted with specially built tanks, electrically heated so as to carry latex or coconut oil in bulk to any climate at exactly the same temperature and condition as when loaded.

THE BOARD OF TRADE COMMITTEE appointed to consider the question of deaths from gas poisoning continued its inquiry this week. Evidence was given by Dr. T. H. C. Stevenson (for the General Register Office), Mr. F. W. Goodenough (for the National Gas Council), and Mr. E. J. Silcock (chairman of the committee which considered the Holborn explosions).

RECENT ELECTIONS to the Fellowship of the Institute of Fuel include Mr. C. J. Goodwin, well known as a consulting chemical engineer in London. Mr. Goodwin was recently elected to full membership of the Institution of Civil Engineers, and we believe there are only two other members of the Institution of Chemical Engineers who have this distinction, namely, Sir Alexander Gibb and Sir Arthur Duckham.

AT THE ADJOURNED GENERAL MEETINGS of the holders of the 5½ per cent. debentures and 5 per cent. first debenture stocks, held by the Mond Nickel Co. on Monday, resolutions embodying proposals for the reduction of the capital and authorising the trustees to concur with the International Nickel Co., of Canada, in executing a deed of agreement and guarantee were carried by the requisite majority. Viscount Erleigh was appointed a trustee for the 5 per cent. first debenture stockholders to fill the vacancy created by the death of Sir John F. L. Brunner.

The I.G. FARBENINDUSTRIE A.-G. intends, according to German reports, to acquire the Rheinische Gummi- and Zelluloidenwarenfabrik, at Mannheim-Neckerau. It is thought that the main object of such an acquisition would be the exploitation of the celluloid manufactured by the I.G., although rumours have also suggested that this new move is designed to find an outlet for synthetic rubber. The I.G. has also purchased from Merz-Werken Gebr. Merz, of Frankfurt, for 500,000 RM., the right to manufacture certain classes of substances (local anæsthetics, etc.) hitherto manufactured by the latter.

THE ANNUAL GENERAL MEETING of the Chemical Industry Club will be held in the club at 8 p.m. on Thursday, October 31. Among the business to be transacted will be the election of five candidates to fill vacancies on the committee, caused by the retirement of present members according to Rule 7, four of whom offer themselves for re-election. Nominations of candidates to fill the vacancies must be in the hands of the secretary not later than the first post on Monday, October 21. Each nomination must be signed by two members of the Club who have ascertained that their candidate is willing to serve if elected.

THE ALEXANDER WACKER CO., of Munich, estimates that the world production of oxygen for sale is now 150,000,000 cubic metres, of which Germany produces 30,000,000 and consumes 12,000,000. In addition, there is another 100,000,000 cubic metres produced in plants where consumed, 35,000,000 cubic metres of which is Germany's share. The hourly capacity of the German plants producing oxygen for sale at the end of 1928 was 3,600 cubic metres. German consumption of acetylene in 1928 was over 1,200,000 cubic metres, and the hourly capacity of the six existing German acetylene works at the close of 1928 reached 310 cubic metres.

Obituary

MR. JOHN WILLIAMS, of Swansea, secretary of the Pontardulais Chemical Works Co., Ltd. Mr. Williams was in his sixty-ninth year.

PROFESSOR AUGUST FRIEDRICH HORSTMANN, at Heidelberg, on October 12, aged 87. He studied under Bunsen and Kirchhoff, and his investigations dealt with the thermodynamics of chemical processes, including dissociation, vapour pressure, combustion, equilibrium, solution theory, etc. For many years past he had suffered from almost complete blindness.

References to Current Literature

British

COLLOIDS.—Studies on the reactions between the hydrophilic sols. I.—Gelatin and silicic acid. W. J. Lesley. *Trans. Faraday Soc.*, October, pp. 570–579.

GENERAL.—Gaseous combustion in electric discharges. G. I. Finch and D. L. Hodge. *Proc. Roy. Soc. A*, October 1, pp. 532–542.

Some modern industrial applications of chlorine. H. R. Feeny. *J. Soc. Dyers and Colourists*, October, pp. 283–286.

Steam production and economy in the rubber factory. G. B. Williamson. *Inst. Rubber Ind. Transactions*, August, pp. 119–138.

PAINTS.—Some optical properties of paints and pigments. F. C. Toy. *Journal Oil and Colour Chem. Assoc.*, September, pp. 225–242.

PECTIN.—The biochemistry of pectin. A. G. Norman *Science Progress*, October, pp. 263–279.

RUBBER.—The swelling of vulcanised rubber in liquids. J. R. Scott. *Inst. Rubber Ind. Transactions*, August, pp. 95–118.

Standardisation of vulcanisation testing. J. R. Scott. *Inst. Rubber Ind. Transactions*, August, pp. 139–150.

Some aspects of rubber manufacture in America. H. Rogers. *Inst. Rubber Ind. Transactions*, August, pp. 151–162.

VITAMINS.—Observations on the assay of vitamin A. J. C. Drummond and R. A. Morton. *Biochemical Journ.*, Vol. 23, No. 4, pp. 785–302.

United States

CARBOHYDRATES.—The mechanism of carbohydrate oxidation. W. L. Evans. *Chemical Reviews*, September, pp. 281–315.

CATALYSIS.—Seventh report of the committee on contact catalysis: Enzyme catalysts. E. F. Armstrong and T. P. Hilditch. *J. Physical Chem.*, October, pp. 1441–1455.

DISTILLATION.—Distillation methods, ancient and modern. G. Egloff and C. D. Lowry, Jr. *Ind. Eng. Chem.*, October 1, pp. 920–923.

FOOD.—On the physics of the ice-cream mix. I.—A relationship between basic viscosity and the whipping capacity of ice-cream mixes. A. Leighton and O. E. Williams. *J. Physical Chem.*, October, pp. 1481–1484.

The basic viscosity and plasticity of ice-cream mixes. A. Leighton and F. E. Kurtz. *J. Physical Chem.*, October, pp. 1484–1488.

Viscosity-plasticity measurements of the effect of gelatin on ice-cream mixes. F. E. Kurtz. *J. Physical Chem.*, October, pp. 1489–1494.

The licorice root in industry. P. A. Houseman and H. T. Lacey. *Ind. Eng. Chem.*, October 1, pp. 915–919.

GENERAL.—The physico-chemistry of creatine and creatinine. H. E. Shiver. *Chemical Reviews*, September, pp. 419–444.

The alleged catalytic action of fuller's earth on colouring matter in oils. J. D. Haseman. *J. Physical Chem.*, October, pp. 1514–1527.

Superheating and the intensive drying of liquids. S. Lenher. *J. Physical Chem.*, October, pp. 1579–1582. Ordinary benzene, carbon tetrachloride and water can be superheated as much as 30° C. above the normal boiling point in reproductions of the apparatus used in intensive drying work. The conditions favouring the superheating of liquids are discussed.

Amyl alcohol from the pentanes. E. E. Ayres. *Ind. Eng. Chem.*, October 1, pp. 899–904.

Some observations on carbon black. C. M. Carson and L. B. Sebrell. *Ind. Eng. Chem.*, October 1, pp. 911–914. Different carbon blacks have certain definite effects upon the vulcanised rubber stocks with which they are mixed. The experiments described may be grouped under four main heads: (1) Adsorption; (2) Effect of heat; (3) Reaction with sulphur and zinc oxide; and (4) Dispersion or rate of settling.

LACQUERS.—Cellulose acetate lacquers. H. E. Hofmann and E. W. Reid. *Ind. Eng. Chem.*, October 1, pp. 955–965. This paper is intended to be the first comprehensive contribution to the modern literature of cellulose acetate coatings.. A brief résumé is given of the earlier steps leading up to the present-day cellulose acetate lacquer, and also an outline of the usual method of preparation of cellulose acetates. Solvents are discussed at some length, as well as plasticisers and resins.

LEATHER.—The oiling of leather. T. G. Rochow. *J. Physical Chem.*, October, pp. 1528–1542.

OILS.—Carbon deposits from lubricating oils. Experiments with heavy-duty engines. G. J. Livingstone and W. A. Gruse. *Ind. Eng. Chem.*, October 1, pp. 904–908. Three very heavy oils of different characteristics were studied under service conditions for 180,000 car-miles in a fleet of motor coaches powered by sleeve-valve engines. These same oils were also tested in a single-cylinder laboratory engine.

Relationship between calorific value and other characteristics of residual fuel oils and cracked residuums. W. F. Faragher, J. C. Morrell, and J. L. Essex. *Ind. Eng. Chem.*, October 1, pp. 933–941. The authors find that the relationship between calorific value in B. Th. U. per pound and A. P. I. gravity of cracked residuums is linear. They confirm also the linear relationship for uncracked fuel oils that have been reported by several other investigators. New formulæ for calculating the calorific value per pound of dry oil were determined as follows: 17,010 (90 × °A.P.I.) for the straight-run fuel oils and 17,645 (54 × °A.P.I.) for the cracked residuums.

German

ANALYSIS.—A new method of determining the water content of solid substances such as lignite. K. Fischbeck and E. Einecke. *Zeitschrift Elektrochem.*, October, pp. 765–769. The method is more rapid than the usual one employing xylol, and incurs no risk of fire.

APPARATUS.—Pressure reducing valves and pressure regulators. K. Schiebl. *Chemische Fabrik*, October 9, pp. 446–448.

ELECTROCHEMISTRY.—The electrolytic reduction of some aromatic carboxylic acids. F. Semlo. *Zeitschrift Elektrochem.*, October, pp. 769–780. Deals with the cathodic reduction of salicylic, phthalic, gallic, pyrogallol-carboxylic and hydroquinone-carboxylic acids, in aqueous and aqueous alcoholic solution, at prepared lead cathodes.

ENZYMES.—The theory of the hydrolysis of organic substances by enzymes. E. Donath. *Chemiker-Zeitung*, October 12, pp. 797–798.

GENERAL.—The preparation of plant alkaloids. *Chemiker-Zeitung*, October 9, pp. 785–786.

The catalytic oxidation of hydrocyanic acid. B. Neumann and G. Manke. *Zeitschrift Elektrochem.*, October, pp. 751–765.

The vapour pressures and latent heats of vaporisation of iron pentacarbonyl, $Fe(CO)_5$. M. Trautz and W. Badstübner. *Zeitschrift Elektrochem.*, October, pp. 799–802.

GLUE, ETC.—Glue and gelatin. O. Gerngross. *Zeitschrift angewandte Chem.*, October 5, pp. 969–972. General methods of testing.

French

GENERAL.—A method of testing motor benzol.. R. Brunschwig and L. Jacqué. *Comptes Rendus*, September 30, pp. 486–489.

A solution of the smoke problem. The use of coke. P. Mougin. *Chimie et Industrie*, September, pp. 462–472.

Variations in the temperature of spontaneous ignition of fuels containing different added substances. A. Grebel. *Chimie et Industrie*, September, pp. 473–480.

The extraction, preparation and use of the natural saponins. A. Lemunice. *L'Industrie Chimique*, September, pp. 482–483.

OILS.—A new process for the production of palm oil. E. Fickendey. *Bulletin Matières Grasses*, No. 8 (1929), pp. 244–247.

ORGANIC.—A study of the process of Wolfenstein and Boters for the preparation of picric acid from benzene. L. Desvergnes. *Chimie et Industrie*, September, pp. 451–461.

Patent Literature

The following information is prepared from published Patent Specifications and from the Illustrated Official Journal (Patents) by permission of the Controller to H.M. Stationery Office. Printed copies of full Patent Specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Abstracts of Complete Specifications

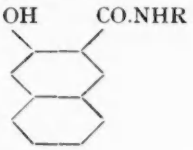
318,842 and 318,909. FERTILISERS, PRODUCTION OF. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, March 10, 1928.

318,842. Specification No. 236,494 (see THE CHEMICAL AGE, Vol. XIII, p. 158) describes the manufacture of mixed fertilisers containing potassium nitrate (with or without potassium sulphate), ammonium phosphate, and urea. In this invention, the urea is replaced wholly or partly by ammonium sulphate, with or without sodium nitrate, so that the proportions of $N : P_2O_5 : K_2O$ are substantially 1 : 0·9 :1·2. The potassium nitrate and the potassium sulphate may be wholly or partly replaced by potassium chloride.

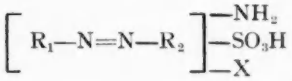
318,909. The urea in the fertiliser referred to above is replaced wholly or partly by sodium nitrate, so that the proportions of $N : P_2O_5 : K_2O$ are substantially 1 : 0·6 : 1·5. The potassium nitrate and/or potassium sulphate may be wholly or partly replaced by potassium chloride. These modified fertilisers have practically the same properties as regards stability and solubility in water, and they are more efficient than the usual mixed fertiliser containing the single separate salts with equivalent quantities of nitrogen, phosphorus, and potassium.

318,882. DISAZO DYESTUFFS, MANUFACTURE OF. A. Carpmael, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, June 11, 1928.

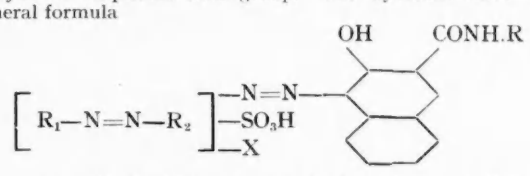
These dyestuffs are obtained by the combination of an arylide of 2 : 3-oxynaphthoic acid of the general formula



in which R represents a substituted or unsubstituted aryl residue with a diazotised amino-azo compound of the general formula



in which R_1 and R_2 represent aryl residues which may be substituted by monovalent groups, and X represents a carboxylic or sulphonic acid group. The dyestuffs have the general formula



In an example, the diazo compound of 1-amino-naphthalene-4-sulphonic acid is coupled with the sodium salt of 1-amino-naphthalene-7-sulphonic acid, and the amino-azo compound formed is diazotised and combined with 2-hydroxy-naphthalene-3-carboxylic acid *p*-anisidide. Some other examples are given. The products dye wool blue to bluish-black shades of good fastness, which may be after-chromed.

318,937. PIGMENTS AND THE LIKE, PREPARATION OF. J. W. C. Crawford, 18, Ardrossan Road, Saltcoats, Ayrshire, G. E. Scharff, Brierwood, Saltcoats, Ayrshire, and Imperial Chemical Industries, Ltd., Millbank, London, S.W.1. Application dates, March 9, 1928, and January 9, 1929.

In the removal of water from wet pigments by filtration, decantation, heating, etc., the original fineness of grain of the pigment may be impaired, and after-grinding may be necessary. In this invention, the wet pigment is mixed with a non-reactive non-miscible liquid, and the mixture than heated to remove the water by distillation in azeotropic mixture with the added liquid. The condensed azeotropic mixture may be separated, and the liquid returned to the process. A suitable liquid is a mixture of benzene or toluene and ethyl alcohol, or homologues of these. The alcohol content may consist of isobutyl alcohol or higher homologues. The dehydration may be effected in the presence of a small proportion of a wetting, dispersing, or emulsifying agent, *e.g.*, metallic resinates, resins, synthetic resins, fatty acids and soaps, higher fatty acid amides, salts of naphthenic acid, waxes, rubber latex, cellulose esters and ethers. The pigment may be mixed also at the beginning or subsequently with high-boiling solvents such as tri-cresyl phosphate or di-butyl phthalate, softening agents or vegetable oils.

318,939. AROMATIC HYDROXY ALDEHYDES, SEPARATION, ISOLATION AND PURIFICATION OF. The Graesser-Monsanto Chemical Works, Ltd., Ruabon, North Wales, and D. P. Hudson, "Haulwen," Abbey Road, Llangollen, Denbigh. Application date, May 11, 1928.

The process is particularly for the separation of mixtures of aromatic hydroxy-aldehydes with isomeric or other closely related phenolic compounds, particularly aldehydes whose near resemblance renders their separation difficult. The separation is effected by taking advantage of the difference in acidity either for selective acidification of the alkali metal salts or selective neutralisation of the free phenols. Thus the free hydroxy compounds may be fractionally dissolved in an alkaline solution or a solution of the alkali salts may be fractionally precipitated by adding an acid. Examples are given of the separation of vanillin from isovanillin, and the method can be applied to the separation of isovanillin from the crude vanillin obtained by the methylation of protocatechuic aldehyde, salicyl-aldehyde may be separated from *p*-hydroxy-benzaldehyde, vanillin from guaiacol, and bourbonal from æthacol. To ensure sharp separation, it is necessary to use a dilute solution of the alkali salts and to effect precipitation by slowly adding dilute mineral acids with agitation.

319,025. DIOLEFINES, RECOVERY OF. O. Y. Imray, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, March 12, 1928.

The process is for the recovery of diolefines from mixtures with hydrocarbons of a less unsaturated character, and also hydrogen. The mixtures are treated with organic solvents such as ethylene chlorhydrin, glycol mono-acetate or diacetate, glycol monomethyl ether, glycerin di- or triacetate, lactic acid nitrile, diethyl tartrate, furfurol, aromatic bases such as aniline, toluidine, or phenylhydrazine. The less unsaturated hydrocarbons are very little dissolved by these solvents. The solvents have a high di-electric value compared to other members of their groups, and their efficiency is due to this. The process is preferably effected by passing the gases through a scrubbing tower containing the liquid solvent, and the solution of diolefines is obtained at the bottom. Examples are given of the recovery of butadiene and isoprene.

319,030. ALIPHATIC ACIDS AND ESTERS, MANUFACTURE OF. H. Dreyfus, Celanese House, 22 and 23, Hanover Square, London, W.1 Application date, March 16, 1928.

Methyl acetate and acetic acid are obtained by the reaction of dimethyl ether with carbon monoxide in the presence of sodium methylate or ethylate or alkali formates. The pressure may be 100–300 atmospheres and the temperature 300°–400° C. The catalyst is preferably supported on coke or graphite. This process may be combined with the production of dimethyl ether. Thus a mixture of methyl alcohol and sulphuric acid may be heated to produce dimethyl ether, and carbon monoxide passed through the hot reaction mixture. The mixture of carbon monoxide and dimethyl ether is then passed through compressors and treated as above. The presence of water favours the production of free acetic acid,

and the absence of water and presence of excess of dimethyl ether favours the production of methyl acetate. The methyl acetate may be saponified and converted into acetic acid and methyl alcohol or dimethyl ether. The apparatus in contact with acetic acid and carbon monoxide may be made of or lined with copper. The reaction products in the vapour state may be treated by the saponification process described in Specification No. 284,582. (See THE CHEMICAL AGE, Vol. XVIII, p. 204) to produce acetic acid of high concentration from methyl acetate. The process is also applicable to the treatment of homologues of dimethyl ether, *e.g.*, propionic acid and/or ethyl propionate may be obtained from diethyl ether.

319,075. ORTHO-CARBOXYAMIDO ARYLTHIOGLYCOLLIC ACIDS, MANUFACTURE OF. A. Carpmael, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, June 19, 1928.

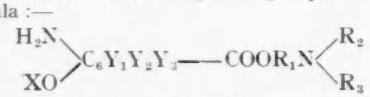
These acids are obtained by treating a substituted ortho-cyanaryl-sulpho-chloride in the presence of a suitable organic solvent with a reducing agent consisting of a metal or a metal salt and strong mineral or organic acid which acts also as an acid hydrolysing agent. The reaction is regulated so that practically no nitrogen of the cyanic group is split off in the form of ammonia, with the formation of an ortho-carboxy-amido-aryl-mercaptan and its condensation with monochlor acetic acid in alkaline solution. The ortho-cyan-aryl-sulpho-chlorides used as starting materials may be obtained by converting the corresponding ortho-amino-aryl-sulphonic acids according to Sandmeyer's reaction into the ortho-cyanaryl-sulphonic acids, and treating these with phosphorus pentachloride or excess of chloro-sulphonic acid. The reduction and subsequent hydrolysis may be effected in the presence of benzene or chlorobenzene, and the reducing agent may be zinc or iron dust or stannous chloride, with the addition of strong hydrochloric acid, glacial acetic acid, formic acid, or naphthalene mono- or poly-sulphonic acids. Examples are given of the production of these compounds, which are intermediates for the production of dyestuffs of the thioindigo series.

NOTE.—Abstracts of the following specifications which are now accepted appeared in THE CHEMICAL AGE when they became open to inspection under the International Convention :—290,253 (I.G. Farbenindustrie Akt.-Ges.), relating to yellow azo dyestuffs, see Vol. XIX, p. 57 ; 292,129 (Montecatini Soc. Generale per l'Industria Mineraria ed Agricola) relating to manufacture of ammonium salts, see Vol. XIX, p. 145 ; 295,276 (I.G. Farbenindustrie Akt.-Ges.) relating to condensation products from acetylene and ammonia, see Vol. XIX, p. 369 ; 297,051 (Goodyear Tire and Rubber Co.) relating to vulcanisation of rubber, see Vol. XIX, p. 497 ; 298,137 (A. Wacker Ges. für Elektro Chemische Industrie Ges.) relating to concentration of acetic acid, see Vol. XIX, p. 543 ; 298,493 (I.G. Farbenindustrie Akt.-Ges.) relating to alkoxy-3-oxythionaphthenes, see Vol. XIX, p. 565 ; 300,922 (F. Bensa) relating to a green vat dyestuff from 1 : 12-perylene-quinone, see Vol. XX, p. 82 ; 301,387 (Stockholms Superfosfat Fabriks Aktiebolag) relating to a mixture of fertilisers, see Vol. XX, p. 105 ; 306,471 (Selden Co.) relating to catalytic reduction of oxides of carbon and organic oxygen compounds, see Vol. XX, p. 432.

International Specifications not yet Accepted

317,296. SYNTHETIC DRUGS. Schering-Kahlbaum Akt.-Ges., 170, Müllerstrasse, Berlin. International Convention date, August 10, 1928.

These compounds, which are anæsthetics, are aminobenzoic acid alkamine esters containing ether groups in the nucleus of the formula :—



where X represents an organic radicle such as alkyl, alkylene, cyclic alkyl, aryl and alkaryl or their derivatives, Y_1, Y_2, Y_3 represent univalent substituents such as hydrogen, halogen, alkyl or oxalkyl, R_1 represents a divalent alkylene residue, and R_2, R_3 represents saturated or unsaturated alkyl residues or joint members of a nitrogen-containing heterocyclic ring. The compounds are prepared from the corresponding nitro- or aminobenzoic acids, and the preparation of 4-nitro-3-methoxybenzoic acid diethylamino-ethanol ester, 4-ethoxy-3-nitrobenzoic acid diethyl-aminoethanol ester, and 3-amino-4-methoxybenzoic acid diethyl-aminoethanol ester is described.

317,323. DYES. I.G. Farbenindustire Akt.-Ges., Frankfort-on-Main, Germany. International Convention date, August 13, 1928.

Disazo dyes are obtained by coupling tetrazotised 4:4'-diamino-triphenylmethane derivatives containing at least one halogen substituent in each of the three benzene nuclei with a 1-(halogen-sulphur) aryl-3-alkyl-5-pyrazolone or a substitution product. Examples are given.

317,325. SYNTHETIC DRUGS. I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. International Convention date, August 13, 1928. Addition to 308,218. (See THE CHEMICAL AGE, Vol. XX, p. 507.)

Therapeutic compounds are obtained by condensing the imino ether of a higher fatty acid, or the fatty acid itself, its ester, chloride or amide, with an aromatic primary or secondary amine having a side chain containing tertiary nitrogen, *e.g.*, *p*-β-diethylamino-ethoxyaniline with the chloride of oleic or palmitic acid.

317,396. SULPHURIC ACID. Calco Chemical Co., Inc., Boundbrook, N.J., U.S.A. (Assignees of N. A. Laury, 157, Foxhurst Road, Rockville Centre, Long Island, New York.) International Convention date, August 15, 1928.

A vanadium catalyst for the contact process is applied to a carrier of chips of non-friable natural diatomaceous earth which have been heated to 1,000° C.

317,437. HYPOCHLORITES. Mathieson Alkali Works, 250, Park Avenue, New York. (Assigness of R. B. MacMullin and M. C. Taylor, Niagara Falls, N.Y., U.S.A.) International Convention date, August 16, 1928.

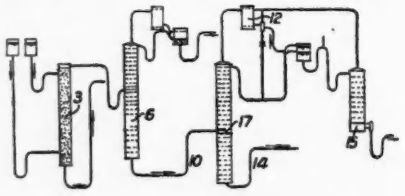
A triple salt having the formula $Ca(OCl)_2.NaOCl.NaCl.12\,H_2O$ is obtained by adding sodium chloride to a saturated solution of calcium hypochlorate at a temperature of 16° C. or less. The solution is seeded with crystals of the triple salt. Alternatively, a mixture of caustic soda, calcium hydroxide, and water in the proportions of 40:37:180 may be chlorinated at 10° C. The product is stable below 22° C. and may be used for bleaching. Other mixtures of hypochlorites may be obtained from the triple salt.

317,454. VARNISHES AND PLASTICS. British Celanese, Ltd., 22, Hanover Square, London. (Assignees of W. H. Moss and B. B. White, Cumberland, Md., U.S.A.) International Convention date, August 16, 1928.

Liquid or plastic compositions for coatings, moulded articles, etc., are made from cellulose acetate, formate, butyrate or propionate, or methyl, ethyl, or benzyl cellulose together with a resin of the toluene sulphonamide type and a plasticizing agent such as triacetin, diphenylol propane, monomethyl xylene sulphonamide, and ethyl toluene sulphonamide. Other solvents and resins may be included.

317,462. ACETIC ACID. Soc. Anon. des Distilleries des Deux-Sèvres, Melle, Deux-Sèvres, France. International Convention date, August 17, 1928.

Dilute acetic acid is treated with a solvent, and the resulting extract of acetic acid is distilled with another liquid forming



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with the acetic acid a binary mixture of minimum boiling point. The dilute acid is treated in a tower 3 with amyl acetate, and the extract is mixed with ethyl acetate and distilled in a column 6 to remove water. The solution of acetic acid in amyl acetate passes by a pipe 10 to a column 17 charged with a petroleum distillate boiling at 114°-116° C. A mixture of acetic acid and petroleum of minimum boiling point passes to a condenser 12, and 1% of water is added to separate it into two layers. The petroleum is returned to column 17, and the acetic acid is freed from traces of petroleum and water in a column 15.

LATEST NOTIFICATIONS.

38,259. Manufacture of sulphuric acid and artificial Portland cement. Meuris, H. October 6, 1928.
17,215. Process for the manufacture of carbon bisulphide. Oehme, H., and Chemische Fabrik Kalk Ges. October 2, 1928.
24,186. Treatment of latex. Naugatuck Chemical Co. October 5, 1928.
25,026. Process for the preparation of anhydrous magnesium chloride free from oxide. I.G. Farbenindustrie Akt.-Ges. October 4, 1928.
26,445. Manufacture of azo-dyestuffs. I.G. Farbenindustrie Akt.-Ges. October 4, 1928.
28,365. Process for obtaining sugar from cellulose or cellulose-containing substances. Commercial Alcohol Co., Ltd. October 2, 1928.
28,369. Process of converting petroleum oils. Petroleum Conversion Corporation. October 6, 1928.
28,371. Process of converting hydrocarbon oils. Petroleum Conversion Corporation. October 6, 1928.
29,701. Process for the production of the cyanamides of the alkaline-earth metals and magnesium. Caro, Dr. N., and Frank, Dr. A. R. October 1, 1928.
29,863. Manufacture of cement powders and mortar powders. I.G. Farbenindustrie Akt.-Ges. October 2, 1928.
30,369. Manufacture of dyestuffs containing metal and the application thereof. Soc. of Chemical Industry in Basle. October 5, 1928.
30,408. Process for the manufacture of alicyclic lactones of tetrahydronaphthalene. I.G. Farbenindustrie Akt.-Ges. October 5, 1928.

Specifications Accepted with Date of Application

290,660. Gas purification process and apparatus. L. Mellersh-Jackson. (*Koppers Co.*) April 27, 1928.
293,001. Hydrogenation products, Manufacture of. Schering-Kahlbaum Akt.-Ges. June 29, 1927. Addition to 276,010 and 280,956.
293,755. Hydrogen peroxide, Manufacture of. Oesterreichische Chemische Werke Ges. July 11, 1927.
294,118. Basic derivatives of substituted quinoline carboxylic acids, Manufacture of. Soc. of Chemical Industry in Basle. July 15, 1927.
294,246. Iron and steel of a low degree of cold-brittleness and blue fracture, Manufacture of. Vereinigte Stahlwerke Akt.-Ges. July 21, 1927.
294,487. Materials containing lead, tin, copper, antimony, Process for working up. Huttonwerk Niederschoneweide Akt.-Ges, July 21, 1927.
296,376. Chemical reactions, Methods of carrying out. H. T. Bucherer. August 30, 1927.
297,062. Sulphur from gases, Recovery of. C. Still. September 13, 1927.
300,129. Shaped pieces consisting of homogeneous alloys of lead with alkali metals or alkaline earth metals, Process of making. O. Y. Imray (*I.G. Farbenindustrie Akt.-Ges.*). November 5, 1928.
302,939. Organic bases, Manufacture of. I.G. Farbenindustrie Akt.-Ges. December 23, 1927. Addition to 283,163 and 296,423.
303,827. Accelerators for rubber vulcanisation, Manufacture of. Goodyear Tire and Rubber Co. January 10, 1928.
310,834. Froth flotation processes, Method and apparatus for. F. Krupp Grusonwerk Akt.-Ges. May 1, 1928.
313,430. Zinc ores. Treatment of. Soc. Minière et Metallurgique de Penarroya. June 11, 1928.
318,582. β-aryl-α-aminopropionic acids and their substitution products, Manufacture of. F. Hoffmann-La Roche and Co. Akt.-Ges. September 6, 1928.
319,593. Condensation products of the benzanthrone series, Production of. J. Y. Johnson. (*I.G. Farbenindustrie Akt.-Ges.*) March 24, 1928.
319,605. Ores and the like containing manganese, Treatment of. S. G. S. Dicker. (*Bradley-Fitch Co.*) June 19, 1928.
319,642. Butyl alcohol and acetone. Production of—by fermentation. Distillers Co., Ltd., and H. B. Hutchinson. June 25, 1928.
319,801. Aqueous dispersions of organic materials such as rubber or the like, Treatment of. Anode Rubber Co. (England), Ltd. (F. Gabor). March 29, 1928.
319,805. Amino derivatives. W. Smith, J. Thomas, and Scottish Dyes, Ltd. April 30, 1928.
319,820. Distilling and cracking oils and the like by contact with salt or metal melts, Process and apparatus for. T. Seifer. June 28, 1928.
319,822. Condensation products of cyanamide and formaldehyde, Manufacture of. A. Carpmael. (*I.G. Farbenindustrie Akt.-Ges.*) June 28, 1928.
319,839. Acid-concentrating and like towers. P. H. Evans and R. C. Bowden. July 3, 1928.
319,850. Chemically active anhydrous oxide of aluminium, Methods for obtaining. G. A. Blanc. July 6, 1928.
319,860. Sulphur dyestuffs, Manufacture of. A. Carpmael. (*I.G. Farbenindustrie Akt.-Ges.*) July 18, 1928.
319,893. Obtaining granular solids. A. J. Collier, F. Heywood, and Imperial Chemical Industries, Ltd. August 27, 1928.
319,899. Alloys. W. P. Digby. August 30, 1928.
319,957. Hydrogen from methane, Manufacture of. J. Y. Johnson. (*I.G. Farbenindustrie Akt.-Ges.*) October 18, 1928.
319,967. Aluminium alloy, Production of. D. R. Tullis. October 31, 1928.

Applications for Patents

Anderson, L. J., Cash, W. A., and Stephens, F. G. C. Production of titanium pigments. 30,892. October 11.
Bataafsche Petroleum Maatschappij and Elkington, H. D. Preparation of dispersions. 30,663, 30,664, 30,665. October 9.
—— Manufacture of acetone. 30,798. October 10.
Bataafsche Petroleum Maatschappij. Preparation of concentrated formic acid solutions. 30,374. October 7. (Holland, October 31, 1928.)
Baxter, J. P., and Imperial Chemical Industries, Ltd. Purification of carbon black. 30,713. October 10.
—— Production of carbon. 30,714. October 10.
Bruson, H. A. Condensation products. 30,897. October 11.
Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Manufacture of anthraquinone dyestuffs. 30,536. October 8.
—— Manufacture of hydrocarbons, etc. 30,649. October 9.
—— Manufacture of azo dyestuffs for wool. 30,800. October 10.
Chemical Reactions, Ltd., and Szeszich, L. von. Catalytic treatment of carbonaceous bodies. 30,657. October 9.
Chemieverfahren-Ges. Production of potassium nitrate. 30,908. October 11. (Germany, November 28, 1928.)
—— Decomposition of crude phosphate. 30,909. October 11. (Germany, November 28, 1928.)
—— Production of potassium nitrate. 30,910. October 11. (Germany, December 5, 1928.)
Govers, F. X. Process of making diphenyl. 30,396. October 7. (United States, November 5, 1928.)
Groves, W. W. Manufacture of reduction products of nitro compounds. 30,773. October 10.
Heerdt-Lingler Ges. Storing and transporting hydrocyanic acids. 30,434. October 8. (Germany, October 22, 1928.)
Herold Akt.-Ges., and Jäger, A. Decolorising phenol-formaldehyde artificial resins. 30,621. October 9.
—— Production of formaldehyde condensation products. 31,014. October 12.
I.G. Farbenindustrie Akt.-Ges., and Johnson, J. Y. Production of colour lakes. 30,351. October 7.
—— Production of olefinic ethers. 30,352. October 7.
—— Manufacture of condensation products containing nitrogen. 30,479. October 8.
—— Production of carbon black. 31,019. October 12.
—— Production of azo dyestuffs. 31,020. October 12.
I.G. Farbenindustrie Akt.-Ges. Manufacture of anthraquinone dyestuffs. 30,536. October 8.
—— Protection of pictures from effect of light. 30,637. October 9.
—— Manufacture of hydrocarbons. 30,649. October 9.
—— Manufacture of reduction products of nitro compounds. 30,773. October 10.
—— Manufacture of azo dyestuffs for wool. 30,800. October 10.
—— Manufacture of chromiferous dyestuffs. 30,874. October 11.
—— Manufacture of alicyclic lactones of tetrahydronaphthalene. 30,408. October 7. (Germany, October 5, 1928.)
—— Manufacture of nitrogen compounds. 30,638. October 9. (Germany, October 15, 1928.)
—— Manufacture of easily soluble salts of acylamino-phenol-arsinic acids. 30,651. October 9. (Germany, October 9, 1928.)
—— Manufacture of α-hydroxyanthrones. 30,774. October 10. (Germany, October 17, 1928.)
—— Manufacture of azo dyestuffs. 30,775. October 10. (Germany, October 10, 1928.)
—— Manufacture of mordant dyestuffs. 30,802. October 10. (Germany, October 10, 1928.)
—— Treatment of road surfaces. 30,875. October 11. (Germany, October 12, 1928.)
—— Printing on wool. 30,948. October 11. (Germany, October 11, 1928.)
Kaufmann, A. A. Manufacture of glycidic acids. 30,462. October 8.
Monsanto Chemical Works and Potts, H. E. Production of caffein. 30,320. October 7.
—— Recovering products from cocoa bye-products. 30,321. October 7.
—— Purification of alkaloids from cocoa products. 30,322. October 7.
Nielsen, H. Apparatus for distillation of solid carbonaceous material. 30,658. October 9. (July 30, 1928.)
Varga, J. Production of hydrocarbons from naphthalene. 30,952. October 11. (Germany, October 13, 1928.)

Weekly Prices of British Chemical Products

The prices and comments given below respecting British chemical products are based on direct information supplied by the British manufacturers concerned. Unless otherwise qualified, the figures quoted apply to fair quantities, net and naked at makers' works.

General Heavy Chemicals

ACID ACETIC, 40% TECH.—£19 per ton.

ACID BORIC, COMMERCIAL.—Crystal, £20 per ton; powder, £21 per ton; extra fine powder, £23 per ton. Packed in 2 cwt. bags carriage paid any station in Great Britain.

ACID HYDROCHLORIC.—3s. 9d. to 6s. per carboy d/d, according to purity, strength and locality.

ACID NITRIC, 80° TW.—£21 10s. to £27 per ton, makers' works according to district and quality.

ACID SULPHURIC.—Average National prices f.o.r. makers' works, with slight variations up and down owing to local considerations; 140° Tw., Crude Acid, 60s. per ton. 168° Tw., Arsenical, £5 10s. per ton. 168° Tw., Non-arsenical, £6 15s. per ton.

AMMONIA ALKALI.—£6 15s. per ton f.o.r. Special terms for contracts.

BISULPHITE OF LIME.—£7 10s. per ton, f.o.r. London, packages free.

BLEACHING POWDER.—Spot, £9 10s. per ton d/d; Contract, £8 10s. per ton d/d, 4-ton lots.

BORAX, COMMERCIAL.—Crystals, £19 10s. to £20 per ton; granulated, £12 10s. per ton; powder, £14 per ton. (Packed in 1 cwt. bags carriage paid any station in Great Britain.)

CALCIUM CHLORIDE (SOLID).—£5 to £5 5s. per ton d/d carr. paid.

COPPER SULPHATE.—£25 to £25 10s. per ton.

METHYLATED SPIRIT 61 O.P.—Industrial, 1s. 3d. to 1s. 8d. per gall. pyridinised industrial, 1s. 5d. to 1s. 10d. per gall.; mineralised 2s. 4d. to 2s. 8d. per gall.; 64 O.P., 1d. extra in all cases.

NICKEL SULPHATE.—£38 per ton d/d.

NICKEL AMMONIA SULPHATE.—£38 per ton d/d.

POTASH CAUSTIC.—£30 to £33 per ton.

POTASSIUM BICHROMATE.—4½d. per lb.

POTASSIUM CHLORATE.—3¾d. per lb., ex-wharf, London, in cwt. kegs.

SALAMMONIAC.—£45 to £50 per ton d/d. Chloride of ammonia, £37 to £45 per ton, carr. paid.

SALT CAKE.—£3 15s. to £4 per ton d/d. In bulk.

SODA CAUSTIC, SOLID.—Spot lots delivered, £15 2s. 6d. to £18 per ton, according to strength; 20s. less for contracts.

SODA CRYSTALS.—£5 to £5 5s. per ton, ex railway depots or ports.

SODIUM ACETATE 97/98%.—£21 per ton.

SODIUM BICARBONATE.—£10 10s. per ton carr. paid.

SODIUM BICHROMATE.—3½d. per lb.

SODIUM BISULPHITE POWDER, 60/62%.—£17 10s. per ton delivered for home market, 1-cwt. drums included; £15 10s. f.o.r. London.

SODIUM CHLORATE.—2¾d. per lb.

SODIUM NITRITE, 100% BASIS.—£27 per ton d/d.

SODIUM PHOSPHATE.—£14 per ton, f.o.b. London, casks free.

SODIUM SULPHATE (GLAUBER SALTS).—£3 12s. 6d. per ton.

SODIUM SULPHIDE CONC. SOLID, 60/65.—£13 5s. per ton d/d. Contract, £13. Carr. paid.

SODIUM SULPHIDE CRYSTALS.—Spot, £8 12s. 6d. per ton d/d. Contract, £8 10s. Carr. paid.

SODIUM SULPHITE, PEA CRYSTALS.—£14 per ton f.o.b. London, 1-cwt. kegs included.

Coal Tar Products

ACID CARBOLIC CRYSTALS.—7d. to 9¾d. per lb. Crude 60's, 2s. 3½d. to 2s. 6d. per gall.

ACID CRESYLIC 99/100.—2s. 2d. to 2s. 7d. per gall. Pure, 5s. 6d. per gall. 97/99.—2s. 1d. to 2s. 2d. per gall. Pale, 95%, 1s. 9d. to 1s. 10d. per gall. 98%, 2s. 2d. to 2s. 5d. Dark, 1s. 6d. to 2s. 2d. Refined, 2s. 7d. to 2s. 10d. per gall.

ANTHRACENE.—A quality, 2d. to 2½d. per unit. 40%, £4 10s. per ton.

ANTHRACENE OIL, STRAINED, 1080/1090.—4¾d. to 5¼d. per gall. 1100, 5¼d. to 6d. per gall.; 1110, 6d. to 6¼d. per gall. Unstrained (Prices only nominal).

BENZOLE.—Prices at works: Crude, 10d. to 11d. per gall.; Standard Motor, 1s. 5d. to 1s. 6d. per gall.; 90%, 1s. 7d. to 1s. 8d. per gall; Pure, 1s. 10d. to 1s. 11d. per gall.

TOLUOLE.—90%, 1s. 9d. to 2s. 1d. per gall. Firm. Pure, 1s. 11d. to 2s. 4d. per gall.

XYLOL.—1s. 5d. to 1s. 10d. per gall. Pure, 1s. 8d. to 2s. 1d. per gall.

CREOSOTE.—Cresylic, 20/24%, 6¾d. to 7d. per gall.; Heavy, 6¼d to 6¾d. per gall. Middle oil, 4¾d. to 5d. per gall. Standard specification, 3d. to 4d. per gall. Light gravity, 2d. to 2¼d. per gall. ex works. Salty, 7¼d. per gall.

NAPHTHA.—Crude, 8¼d. to 8¾d. per gall. Solvent, 90/160, 1s. 3d. to 1s. 3½d. per gall. Solvent, 95/160, 1s. 4d. to 1s. 5d. per gall. Solvent 90/190, 1s. to 1s. 3d. per gall.

NAPHTHALENE, CRUDE.—Drained Creosote Salts, £4 10s. to £5 per ton. Whizzed, £5 per ton. Hot pressed, £8 10s. per ton.

NAPHTHALENE.—Crystals, £12 5s. per ton. Purified Crystals, £14 10s. per ton. Quiet Flaked, £14 to £15 per ton, according to districts.

PITCH.—Medium soft, 47s. 6d. per ton, f.o.b., according to district. Nominal.

PYRIDINE.—90/140, 3s. 9d. to 4s. per gall. 90/160, 3s. 6d. to 3s. 9d. per gall. 90/180, 1s. 9d. to 2s. 3d. per gall. Heavy, prices only nominal.

Intermediates and Dyes

In the following list of Intermediates delivered prices include packages except where otherwise stated:

ACID AMIDONAPHTHOL DISULPHO (1-8-2-4).—10s. 9d. per lb.

ACID ANTHRANILIC.—6s. per lb. 100%.

ACID BENZOIC.—1s. 8½d. per lb.

ACID GAMMA.—4s. 6d. per lb.

ACID H.—3s. per lb.

ACID NAPHTHIONIC.—1s. 6d. per lb.

ACID NEVILLE AND WINTHER.—4s. 9d. per lb.

ACID SULPHANILIC.—8½d. per lb.

ANILINE OIL.—8d. per lb. naked at works.

ANILINE SALTS.—8d. per lb. naked at works.

BENZALDEHYDE.—2s. 3d. per lb.

BENZIDINE BASE.—3s. 3d. per lb. 100% basis d/d.

BENZOIC ACID.—1s. 8½d. per lb.

o-CRESOL 29/31° C.—£3 1s. 10d. per cwt., in 1 ton lots.

m-CRESOL 98/100%.—2s. 9d. per lb, in ton lots d/d.

p-CRESOL 32/34° C.—1s. 11d. per lb, in ton lots d/d.

DICHLORANILINE.—1s. 10d. per lb.

DIMETHYLANILINE.—1s. 11d. per lb.

DINITROBENZENE.—8d. per lb. naked at works. £75 per ton.

DINITROCHLORBENZENE.—£84 per ton d/d.

DINITROTOLUENE.—48/50° C. 7½d. per lb. naked at works. 66/68° C, 9d. per lb. naked at works.

DIPHENYLAMINE.—2s. 10d. per lb. d/d.

a-NAPHTHOL.—2s. per lb. d/d.

B-NAPHTHOL.—10d. per lb. d/d.

a-NAPHTHYLAMINE.—1s. 3d. per lb.

B-NAPHTHYLAMINE.—3s. per lb.

o-NITRANILINE.—5s. 9d. per lb.

m-NITRANILINE.—3s. per lb. d/d.

p-NITRANILINE.—1s. 8d. per lb.

NITROBENZENE.—6d. per lb. naked at works

NITRONAPHTHALENE.—1s. 3d. per lb.

R. SALT.—2s. 2d. per lb.

SODIUM NAPHTHIONATE.—1s. 8½d. per lb. 100% basis d/d.

o-TOLUIDINE.—8d. per lb.

p-TOLUIDINE.—1s. 9d. per lb. naked at works.

m-XYLIDINE ACETATE.—2s. 6d. per lb. 100%.

N. W. ACID.—4s. 9d. per lb. 100%.

Wood Distillation Products

ACETATE OF LIME.—Brown, £9 15s. to £10 5s. per ton. Grey, £16 10s. to £17 10s. per ton. Liquor, 9d. per gall.

ACETONE.—£78 per ton.

CHARCOAL.—£6 to £8 10s. per ton, according to grade and locality.

IRON LIQUOR.—1s. 3d. per gall, 32° Tw. 1s. per gall. 24° Tw.

RED LIQUOR.—9d. to 10½d. per gall. 16° Tw.

WOOD CRESOTE.—1s. 9d. per gall. Unrefined.

WOOD NAPHTHA, MISCIBLE.—3s. 8d. to 3s. 11d. per gall. Solvent, 4s. to 4s. 3d. per gall.

WOOD TAR.—£3 10s. to £4 10s. per ton.

BROWN SUGAR OF LEAD.—£38 per ton.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 6½d. to 1s. 3d. per lb. according to quality; Crimson, 1s. 4d. to 1s. 6d. per lb., according to quality.

ARSENIC SULPHIDE, YELLOW.—1s. 10d. to 2s. per lb.

BARYTES.—£5 10s. to £7 per ton, according to quality.

CADMIUM SULPHIDE.—5s. to 6s. per lb.

CARBON BISULPHIDE.—£25 to £27 10s. per ton, according to quantity

CARBON BLACK.—5½d. per lb., ex wharf.

CARBON TETRACHLORIDE.—£40 to £50 per ton, according to quantity, drums extra.

CHROMIUM OXIDE, GREEN.—1s. 2d. per lb.

DIPHENYLGUANIDINE.—3s. 9d. per lb.

INDIARUBBER SUBSTITUTES, WHITE AND DARK.—4¾d. to 5¼d. per lb.

LAMP BLACK.—£30 per ton, barrels free.

LEAD HYPOSULPHITE.—9d. per lb.

LITHOPONE, 30%.—£20 to £22 per ton.

MINERAL RUBBER "RUBPRON."—£13 12s. 6d. per ton, f.o.r. London

SULPHUR.—£10 to £13 per ton, according to quality.

SULPHUR CHLORIDE.—4d. to 7d. per lb., carboys extra

SULPHUR PRECIP. B. P.—£55 to £60 per ton.

THIOCARBAMIDE.—2s. 6d. to 2s. 9d. per lb., carriage paid.

THIOCARBANILIDE.—2s. 1d. to 2s. 3d. per lb.

VERMILION, PALE OR DEEP.—6s. 6d. to 6s. 9d. per lb.

ZINC SULPHIDE.—8d. to 11d. per lb.

Pharmaceutical and Photographic Chemicals

ACID, ACETIC, PURE, 80%.—£37 per ton ex wharf London, barrels free.

ACID, ACETYL SALICYLIC.—2s. 9d. to 2s. 11d. per lb., according to quantity.

ACID, BENZOIC, B.P.—2s. to 3s. 3d. per lb., according to quantity. Solely ex Gum, 1s. 6d. per oz.; 50-oz. lots, 1s. 3d. per oz.

ACID, BORIC B.P.—Crystal, £32 per ton; powder, £36 per ton; extra fine powder, £38 per ton. Packed in 2-cwt. bags carriage paid any station in Great Britain.

ACID, CAMPHORIC.—19s. to 21s. per lb.

ACID, CITRIC.—2s. 0½d. to 2s. 1d. per lb., less 5%.

ACID, GALLIC.—2s. 8d. per lb. for pure crystal, in cwt. lots.

ACID, MOLYBDIC.—5s. 3d. per lb. in ¼ cwt. lots. Packages extra. Special prices for quantities and contracts.

ACID, PYROGALLIC, CRYSTALS.—7s. 3d. per lb. Resublimed, 8s. 3d.

ACID, SALICYLIC, B.P. PULV.—1s. 5d. to 1s. 7d. per lb. Technical.—1s. to 1s. 2d. per lb.

ACID, TANNIC B.P.—2s. 8d. to 2s. 10d. per lb.

ACID, TARTARIC.—1s. 5d. per lb., less 5%.

ACETANILIDE.—1s. 5d. to 1s. 8d. per lb. for quantities.

AMIDOL.—7s. 6d. to 9s. per lb., d/d.

AMIDOPYRIN.—7s. 9d. to 8s. per lb.

AMMONIUM BENZOATE.—3s. 3d. to 3s. 9d. per lb., according to quantity. 18s. per lb. ex Gum.

AMMONIUM CARBONATE B.P.—£36 per ton. Powder, £39 per ton in 5 cwt. casks. Resublimated, 1s. per lb.

AMMONIUM MOLYBDATE.—4s. 9d. per lb. in ¼ cwt. lots. Packages extra. Special prices for quantities and contracts.

ATROPHINE SULPHATE.—9s. per oz.

BARBITONE —5s. 9d. to 6s. per lb.

BENZONAPHTHOL.—3s. to 3s. 3d. per lb. spot.

BISMUTH CARBONATE.—8s. 9d. per lb.

BISMUTH CITRATE.—8s. 3d. per lb.

BISMUTH SALICYLATE.—8s. 3d. per lb.

BISMUTH SUBNITRATE.—7s. 6d. per lb.

BISMUTH NITRATE.—Cryst. 5s. 3d. per lb.

BISMUTH OXIDE.—11s. 3d. per lb.

BISMUTH SUBCHLORIDE.—10s. 3d. per lb.

BISMUTH SUBGALLATE.—7s. 3d. per lb. Extra and reduced prices for smaller and larger quantities of all bismuth salts respectively.

BISMUTHI ET AMMON LIQUOR.—Cit. B.P. in W. Qts. 1s. 0½d. per lb.; 12 W. Qts. 11½d. per lb.; 36 W Qts. 11d. per lb.

BORAX B.P.—Crystal, £20 per ton; powder, £21 per ton. Packed in 1- or 2-cwt. bags carriage paid any station in Great Britain.

BROMIDES.—Ammonium, 1s. 11½d. per lb.; potassium, 1s. 8½d. per lb.; granular, 1s. 7½d. per lb.; sodium, 1s. 10½d. per lb. Prices for 1 cwt. lots.

CALCIUM LACTATE.—B.P., 1s. 2d. to 1s. 3d per lb., in 1-cwt. lots.

CAMPHOR.—Refined flowers, 3s. 3d. to 3s. 4d. per lb., according to quantity; also special contract prices.

CHLORAL HYDRATE.—3s. 1d. to 3s. 4d. per lb.

CHLOROFORM.—2s. 4½d. to 2s. 7½d. per lb., according to quantity.

CREOSOTE CARBONATE.—6s. per lb.

ETHERS.—S.G. ·730—11d. to 1s. per lb., according to quantity other gravities at proportionate prices.

FORMALDEHYDE, 40%.—37s. per cwt., in barrels, ex wharf.

GUAIACOL CARBONATE.—4s. 6d. to 4s. 9d. per lb.

HEXAMINE.—2s. 3d. to 2s. 6d. per lb.

HOMATROPINE HYDROBROMIDE.—30s. per oz.

HYDRASTINE HYDROCHLORIDE.—English make offered at 120s. per oz.

HYDROGEN PEROXIDE (12 VOLS.).—1s. 4d. per gallon, f.o.r. makers' works, naked. Winchesters, 2s. 11d. per gall. B.P., 10 vols., 2s. to 2s. 3d. per gall.; 20 vols., 4s. per gall.

HYDROQUINONE.—3s. 9d. to 4s. per lb., in cwt. lots.

HYPOPHOSPHITES.—Calcium, 2s. 5d. per lb.; potassium, 2s. 8½d. per lb.; sodium, 2s. 7½d. per lb., in 1 cwt. lots, assorted.

IRON AMMONIUM CITRATE.—B.P., 2s. 8d. to 2s. 11d. per lb. Green, 3s. 1d. to 3s. 4d. per lb. U.S.P., 2s. 9d. to 3s. per lb.

IRON PERCHLORIDE.—18s. to 20s. per cwt., according to quantity.

IRON QUININE CITRATE.—B.P., 8½d. to 9½d. per oz., according to quantity.

MAGNESIUM CARBONATE.—Light commercial, £31 per ton net.

MAGNESIUM OXIDE.—Light commercial, £62 10s. per ton, less 2½%; Heavy commercial, £21 per ton, less 2½%; in quantity lower; Heavy Pure, 2s. to 2s. 3d. per lb.

MENTHOL.—A.B.R. recrystallised B.P., 19s. per lb. net; Synthetic, 10s. 6d. to 12s. per lb.; Synthetic detached crystals 10s. 6d. to 16s. per lb., according to quantity; Liquid (95%), 9s. per lb.

MERCURIALS B.P.—Up to 1 cwt. lots, Red Oxide, crystals, 8s. 4d. to 8s. 5d. per lb., levig., 7s. 10d. to 7s. 11d. per lb.; Corrosive Sublimate, Lump, 6s. 7d. to 6s. 8d. per lb., Powder, 6s. to 6s. 1d. per lb.; White Precipitate, Lump, 6s. 9d. to 6s. 10d. per lb., Powder, 6s. 10d. to 6s. 11d. per lb., Extra Fine, 6s. 11d. to 7s. per lb.; Calomel, 7s. 2d. to 7s. 3d. per lb.; Yellow Oxide, 7s. 8d. to 7s. 9d. per lb.; Persulph, B.P.C., 6s. 11d. to 7s. per lb.; Sulph. nig., 6s. 8d. to 6s. 9d. per lb. Special prices for larger quantities.

METHYL SALICYLATE.—1s. 6d. to 1s. 8d. per lb.

METHYL SULPHONAL.—18s. 6d. to 20s. per lb.

METOL.—9s. to 11s. 6d. per lb. British make.

PARAFORMALDEHYDE.—1s. 9d. per lb. for 100% powder.

PARALDEHYDE.—1s. 4d. per lb.

PHENACETIN.—3s. 2½d. to 3s. 8½d. per lb.

PHENAZONE.—5s. 11d. to 6s. 1½d. per lb.

PHENOLPHTHALEIN.—5s. 11d. to 6s. 1½d. per lb.

POTASSIUM BITARTRATE 99/100% (Cream of Tartar).—102s. to 104s. per cwt., less 2½ per cent.

POTASSIUM CITRATE.—B.P.C., 2s. 7d. per lb. in 1 cwt. lots.

POTASSIUM FERRICYANIDE.—1s. 9d. per lb., in cwt. lots.

POTASSIUM IODIDE.—16s. 8d. to 17s. 2d. per lb., according to quantity.

POTASSIUM METABISULPHITE.—6d. per lb., 1-cwt. kegs included f.o.r. London.

POTASSIUM PERMANGANATE.—B.P. crystals, 5½d. per lb., spot.

QUININE SULPHATE.—1s. 8d. to 1s. 9d. per oz., bulk in 100 oz. tins.

RESORCIN.—2s. 10d. to 3s. per lb., spot.

SACCHARIN.—43s. 6d. per lb.

SALOL.—2s. 3d. to 2s. 6d. per lb.

SODIUM BENZOATE, B.P.—1s. 8d. to 1s. 11d. per lb.

SODIUM CITRATE, B.P.C., 1911.—2s. 4d. per lb., B.P.C. 1923—2s. 7d. per lb. Prices for 1 cwt. lots. U.S.P., 2s. 6d. to 2s. 9d. per lb., according to quantity.

SODIUM FERROCYANIDE.—4d. per lb., carriage paid.

SODIUM HYPOSULPHITE, PHOTOGRAPHIC.—£15 per ton, d/d consignee's station in 1-cwt. kegs.

SODIUM NITROPRUSSIDE.—16s. per lb.

SODIUM POTASSIUM TARTRATE (ROCHELLE SALT).—100s. to 105s. per cwt. Crystals, 5s. per cwt. extra.

SODIUM SALICYLATE.—Powder, 2s. 2d. to 2s. 4d. per lb. Crystal, 2s. 3d. to 2s. 5d. per lb.

SODIUM SULPHIDE, PURE RECRYSTALLISED.—10d. to 1s. 1d. per lb.

SODIUM SULPHITE, ANHYDROUS.—£27 10s. to £29 10s. per ton, according to quantity. Delivered U.K.

SULPHONAL.—9s. 6d. to 10s. per lb.

TARTAR EMETIC, B.P.—Crystal or powder, 2s. 1d. to 2s. 3d. per lb.

THYMOL.—Puriss., 9s. 1d. to 9s. 4d. per lb., according to quantity Firmer. Natural, 12s. per lb.

Perfumery Chemicals

ACETOPHENONE.—7s. per lb.

AUBEPINE (EX ANETHOL).—12s. per lb.

AMYL ACETATE.—2s. 6d. per lb.

AMYL BUTYRATE.—5s. per lb.

AMYL CINNAMIC ALDEHYDE.—15s. per lb.

AMYL SALICYLATE.—2s. 9d. per lb.

ANETHOL (M.P. 21/22° C.).—6s. 6d. per lb.

BENZALDEHYDE FREE FROM CHLORINE.—2s. 3d. per lb.

BENZYL ACETATE FROM CHLORINE-FREE BENZYL ALCOHOL.—1s. 10d. per lb.

BENZYL ALCOHOL FREE FROM CHLORINE.—1s. 10d. per lb.

BENZYL BENZOATE.—2s. 3d. per lb.

CINNAMIC ALDEHYDE NATURAL.—13s. 3d. per lb.

COUMARIN.—8s. 9d. per lb.

CITRONELLOL.—9s. per lb.

CITRAL.—8s. per lb.

ETHYL CINNAMATE.—6s. 6d. per lb.

ETHYL PHTHALATE.—3s. per lb.

EUGENOL.—11s. 9d. per lb.

GERANIOL (PALMAROSA).—21s. per lb.

GERANIOL.—6s. 6d. to 10s. per lb.

HELIOTROPINE.—7s. per lb.

ISO EUGENOL.—13s. 9d. per lb.

LINALOL.—Ex Bois de Rose, 12s. 6d. per lb. Ex Shui Oil, 10s. per lb.

LINALYL ACETATE.—Ex Bois de Rose, 15s. per lb. Ex Shui Oil, 12s. per lb.

PHENYL ETHYL ACETATE.—11s. per lb.

PHENYL ETHYL ALCOHOL.—10s. per lb.

RHODINOL.—56s. per lb.

SAFROL.—2s. 6d. per lb.

TERPINEOL.—1s. 6d. per lb.

VANILLIN, EX CLOVE OIL.—13s. to 15s. per lb. Ex Guaiacol, 12s. 9d. to 14s. per lb.

Essential Oils

ALMOND OIL.—Foreign S.P.A., 10s. per lb.

ANISE OIL.—4s. per lb.

BERGAMOT OIL.—15s. 3d. per lb.

BOURBON GERANIUM OIL.—21s. per lb.

CANANGA OIL, JAVA.—11s. 6d. per lb.

CASSIA OIL, 80/85%.—5s. 6d. per lb.

CINNAMON OIL LEAF.—8s. 6d. per oz.

CITRONELLA OIL.—Java, 2s. 10d. per lb., c.i.f. U.K. port. Ceylon, pure, 2s. 4d. per lb.

CLOVE OIL (90/92%).—8s. 3d. per lb.

EUCALYPTUS OIL, AUSTRALIAN, B.P. 70/75%.—1s. 10d. per lb.

LAVENDER OIL.—Mont Blanc, 38/40%, 15s. 3d. per lb.

LEMON OIL.—14s. 6d. per lb.

LEMONGRASS OIL.—4s. per lb.

ORANGE OIL, SWEET.—16s. per lb.

London Chemical Market

The following notes on the London Chemical Market are specially supplied to* THE CHEMICAL AGE *by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., and may be accepted as representing these firms' independent and impartial opinions.

London, October 17, 1929.

PRICES remain steady with most articles in fair demand. The improvement in the export trade continues.

General Chemicals

ACETONE.—Firm at £75 to £85 per ton, and in steady demand.

ACETIC ACID.—Firm at £36 10s. per ton for 80% with usual extra for edible quality and in steady demand.

ACID CITRIC.—Remains rather slow. Prices unchanged at about 2s. 3d. per lb., less 5%.

ACID LACTIC.—£43 per ton for 50% weight, and in steady demand.

ACID OXALIC is unchanged at £30 7s. 6d. per ton to £32 per ton, according to quantity, with steady inquiry.

ACID TARTARIC is quiet at 1s. 5d. per lb., less 5%.

ALUMINA SULPHATE.—Unchanged and firm at £7 15s. to £8 per ton.

ARSENIC.—Quiet at £16 17s. 6d. per ton, free on rails mines.

BORAX.—About £13 per ton, and in steady demand.

CREAM OF TARTAR is very firm at £104 to £109 per ton.

COPPER SULPHATE.—Firm at £28 per ton. The improvement in the demand continues.

FORMALDEHYDE is steady at £36 per ton, and in active demand.

LEAD ACETATE.—Firm at £44 per ton for white, £1 per ton less for brown, with an increasing demand.

LEAD NITRATE.—Steady at £33 15s. per ton.

LIME ACETATE.—Unchanged.

LITHOPONE.—Steady at £19 15s. to £23 per ton, according to grade.

METHYL ACETONE is unchanged at £58 10s. per ton.

POTASSIUM CARBONATE.—Steady at £27 per ton for 96/98%.

POTASSIUM CHLORATE.—Firm at £30 per ton.

POTASSIUM PERMANGANATE is very firm at 5½d. to 5¾d. per lb., with an increasing demand.

POTASSIUM PRUSSIATE is in active demand at £03 10s. to £65 10s. per ton, with a firm position.

SODIUM ACETATE is in steady demand and firm at £22 to £23 per ton for crystals.

SODIUM BICHROMATE.—In good demand at 3¾d. per lb.

SODIUM HYPO PHOTOGRAPHIC QUALITY.—Unchanged at £14 10s. to £15 per ton. Commercial, £8 10s. to £9 per ton.

SODIUM NITRATE is steady at £20 per ton, and in good request.

SODIUM PHOSPHATE.—Tribasic, £17 per ton, dibasic £12 per ton, and in steady demand.

SODIUM PRUSSIATE is unchanged and firm at 4¾d. to 5¼d. per lb., with an active demand.

TARTAR EMETIC is firmer at 11½d. per lb.

ZINC SULPHATE is unchanged at £13 10s. per ton.

Coal Tar Products

There is no important change to report in the market for coal tar products, prices remaining firm with a scarcity of business.

MOTOR BENZOL remains at about 1s. 5½d. to 1s. 6d. per gal., f.o.r. makers' works.

SOLVENT NAPHTHA is unchanged at about 1s. 2½d. to 1s. 3d. per gal., f.o.r.

HEAVY NAPHTHA is quoted at about 1s. 1d. per gallon, f.o.r.

CREOSOTE OIL remains at 3½d. to 4d. per gal. on rails in the North, and at 4¾d. per gal. in London.

NAPHTHALENES remain at about £4 10s. per ton for the firelighter quality, at £5 per ton for the 74/76 quality, and at £6 to £6 5s. per ton for the 76/78 quality.

PITCH remains firm, at 45s. to 47s. 6d. per ton, f.o.b. East Coast port.

Nitrogen Products

Sulphate of Ammonia.—The price of sulphate of ammonia remains unchanged at £8 18s. 9d. per ton, f.o.b. U.K. port, in single bags, for neutral quality, basis 20·60 per cent. nitrogen. Sales on the Continent continue to be small, but more distant markets are purchasing considerable quantities.

Home.—Sales in the home market continue to be small, but deliveries to fertiliser manufacturers are well maintained.

Nitrate of Soda.—Shipments to Europe and Egypt are nearly 50 per cent. above those of last year, whereas shipments to the United States show an increase of about 30 per cent. The week has witnessed a falling off of the good demand that was experienced after the first announcement of the price scale for 1929–30. In the United States there have been considerable bookings for November to January shipment. The demand for synthetic nitrate of soda in the United States continues to be satisfactory.

Latest Oil Prices

LONDON, October 16.—LINSEED OIL closed quieter at about unchanged rates. Spot, ex mill, £45 10s.; October, £43 10s., November-December, £43; and January-April, £41 17s. 6d., naked. RAPE OIL was inactive. Crude extracted, £44; technical refined, £45 10s., naked, ex wharf. COTTON OIL was dull and 20s. per ton lower for crude Egyptian at £33. Refined common edible remained at £38; and deodorised at £40, naked, ex mill. TURPENTINE was quiet and 3d. per cwt. lower. American, spot, 44s.; November-December, 44s. 6d.; and January-April, 46s.

HULL.—LINSEED OIL.—Spot, £44 7s. 6d.; October and November-December, £44 5s.; January-April, £43 2s. 6d. per ton, naked. COTTON OIL.—Egyptian crude spot, £32; November-December (new), £30 15s.; edible refined spot, £37 10s.; technical spot, £36; deodorised spot, £39 10s. per ton, naked. PALM KERNEL OIL.—Crude 5½ per cent. spot, £34 per ton, naked. GROUNDNUT OIL.—Crushed/extracted spot, £37 10s.; deodorised spot, £41 10s. per ton. SOYA OIL.—Extracted and crushed spot, £34 10s.; deodorised spot, £38 per ton. RAPE OIL.—Crushed/extracted spot, £43 10s.; refined spot, £45 10s. per ton net cash terms, ex mill. TURPENTINE, CASTOR OIL, and COD OIL unchanged.

South Wales By-Products

THERE is slightly more activity in South Wales by-products. Pitch is moving much more freely, the general feeling being that values, if they change, will be in an upward direction. Present quotations are on a basis of 49s. to 50s. per ton delivered. Road tar remains unchanged at 10s. 6d. to 13s. per 40-gallon barrel. Creosote has only a small demand, and values are unchanged on a basis of 3¼d. to 3¾d. per gallon. Solvent and heavy naphthas are inactive. Refined tars continue to have a good, average demand, with quotations unchanged for both coke oven and gasworks tar. Sulphate of ammonia has a quiet call. Patent fuel and coke exports are expanding, but business remains far from satisfactory. Patent fuel quotations are:—Ex-ship Cardiff, 22s. to 22s. 6d.; ex-ship Swansea, 20s. to 21s.; and ex-ship Newport, 20s. to 21s. per ton. Coke quotations are:—Best foundry, 35s. to 37s.; good foundry, 32s. 6d. to 35s.; and furnace from 20s. to 30s. per ton. Oil imports continue to be small, the total import (all Persian Gulf oil) over the last four ascertainable weeks period being 16,631,230 gallons.

Scottish Coal Tar Products Market

BUSINESS during the current week has been quiet, the only item which is showing any activity being cresylic acid. Coal tar pitch is very scarce in Scotland, as makers have not yet discontinued manufacturing road tar, which is still in fair demand.

Cresylic Acid is very scarce and prices have advanced during the week. Pale, 97/99%, 1s. 11d. to 2s. per gal.; dark, 97/99%, 1s. 9d. to 1s. 10d. per gal.; pale, 99/100%, 2s. 2d. to 2s. 4d. per gal., all free on rails works in buyers' packages.

Carbolic Acid Sixties.—The quantity available in Scotland is small, but one or two lots are changing hands at about 2s. 4d. to 2s. 6d. per gal. for "water over 5% grade."

Creosote Oil.—Prices are steady and home buyers are covering for delivery to end of year. B.E.S.A. specification, 4½d. to 5d. per gal.; gas works ordinary, 3d. to 3½d. per gal.; washed oil, 3¼d. to 3¾d. per gal.

Coal Tar Pitch.—This article is unobtainable in large quantities at present and prices are nominal as follows:—Coke oven and horizontal, 47s. 6d., f.a.s. Glasgow; vertical, 45s., f.a.s. Glasgow.

Blast Furnace Pitch.—Prices have been fixed at 30s. per ton, rails works, for home trade, and 35s. per ton, f.a.s. Glasgow, for export. Packing charges extra.

Refined Coal Tar.—Works are busy fulfilling old contracts and new business is falling off. The price is nominal at 3½d. to 3¾d. per gal. at works in buyers' packages.

Blast Furnace Tar is very quiet at fixed price of 2¾d. per gal., rails works, in buyers' packages.

Water White Products are quiet and prices are approximately as follows: 90/160 solvent naphtha, 1s. 2½d. to 1s. 3d. per gal.; 90/190 solvent naphtha, 1s. 1d. to 1s. 1½d. per gal.; benzole, 1s. 5¼d. to 1s. 5¾d. per gal.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.*

Glasgow, October 16, 1929.

SINCE our last report business has, if anything, been better, and the proportion of actual orders booked in relation to inquiry is also considerably better than for some little time. This particularly applies to export business. There are no changes in prices of any importance to record.

Industrial Chemicals

ACETONE, B.G.S.—£70 10s. to £85 per ton, ex wharf, according to quantity. Inquiry remains satisfactory.

ACID ACETIC.—This material is still scarce for immediate supply, but prices remain unchanged as follows: 98/100% glacial, £56 to £67 per ton, according to quality and packing, c.i.f. U.K. ports; 80% pure, £37 10s. per ton, ex wharf; 80% technical, £37 10s. per ton, ex wharf.

ACID BORIC.—Crystals, granulated or small flakes, £30 per ton. Powder, £32 per ton, packed in bags, carriage paid U.K. stations. There are a few fairly cheap offers made from the Continent.

ACID CARBOLIC, ICE CRYSTALS.—Prompt delivery difficult to obtain and prices now quoted for early delivery round about 8d. per lb., delivered or f.o.b. U.K. ports.

ACID CITRIC, B.P. CRYSTALS.—Quoted 2s. 2d. per lb., less 5%, ex store, prompt delivery. Rather cheaper offers for early delivery from the Continent.

ACID HYDROCHLORIC.—Usual steady demand. Arsenical quality, 4s. per carboy; dearsenicated quality, 5s. 6d. per carboy, ex works, full wagon loads.

ACID NITRIC, 80° QUALITY.—£24 10s. per ton, ex station, full truck loads.

ACID OXALIC, 98/100%.—On offer at about 3¼d. per lb., ex store. Offered from the Continent at 3⅛d. per lb., ex wharf.

ACID SULPHURIC.—£2 15s. per ton ex works for 144° quality; £5 15s. per ton for 168°. Dearsenicated quality, 20s. per ton extra.

ACID TARTARIC, B.P. CRYSTALS.—Quoted 1s. 5d. per lb., less 5%, ex wharf. On offer for prompt delivery from the Continent at 1s. 4½d. per lb., less 5%, ex wharf.

ALUMINA SULPHATE.—Quoted at round about £7 10s. per ton, ex store.

ALUM, LUMP POTASH.—Now quoted £8 7s. 6d. per ton, c.i.f. U.K. ports. Crystal meal about 2s. 6d. per ton less.

AMMONIA, ANHYDROUS.—Quoted 7½d. per lb., carriage paid. Containers extra and returnable.

AMMONIA CARBONATE.—Lump quality quoted £36 per ton, powdered £38 per ton, packed in 5 cwt. casks, delivered U.K. stations or f.o.b. U.K. ports.

AMMONIA LIQUID, 880.—Unchanged at about 2½d. to 3d. per lb., delivered according to quantity.

AMMONIA MURIATE.—Grey galvanisers' crystals of British manufacture quoted £21 to £22 per ton, ex station. Fine white crystals offered from the Continent at about £17 5s. per ton, c.i.f. U.K. ports.

ANTIMONY OXIDE.—Spot material quoted £35 per ton, ex wharf. On offer for prompt shipment from China at £33 10s. per ton, c.i.f. U.K. ports.

ARSENIC, WHITE POWDERED.—Now quoted £18 per ton, ex wharf, prompt despatch from mines. Spot material still on offer at £19 15s. per ton, ex store.

BARIUM CHLORIDE.—In good demand and price about £11 per ton, c.i.f. U.K. ports.

BLEACHING POWDER.—British manufacturers' contract price to consumers unchanged at £6 12s. 6d. per ton, delivered in minimum 4-ton lots. Continental now offered at about the same figure.

CALCIUM CHLORIDE.—Remains unchanged. British manufacturers' price £4 5s. per ton to £4 15s. per ton, according to quantity and point of delivery. Continental material on offer at £3 12s. 6d. per ton, c.i.f. U.K. ports.

COPPERAS, GREEN.—Unchanged at about £3 10s. per ton, f.o.r. works, or £4 12s. 6d. per ton f.o.b. U.K. ports.

FORMALDEHYDE, 40%.—Remains steady at about £36 10s. per ton, ex works.

GLAUBER SALTS.—English material quoted £4 10s. per ton, ex station. Continental on offer at about £3 5s. per ton, ex wharf.

LEAD, RED.—Price now £37 10s. per ton, delivered buyers' works.

LEAD, WHITE.—Quoted £37 10s. per ton, c.i.f. U.K. ports.

LEAD ACETATE.—White crystals quoted round about £39 to £40 per ton, ex wharf. Brown on offer at about £2 per ton less.

MAGNESITE, GROUND CALCINED.—Quoted £8 10s. per ton, ex store. In moderate demand.

METHYLATED SPIRIT.—Industrial quality 64 O.P. quoted 1s. 4d. per gallon, less 2½%, delivered.

POTASSIUM BICHROMATE.—Quoted 4⅜d. per lb. delivered U.K. or c.i.f. Irish ports, with an allowance of 2½% for minimum 2½ tons to be taken.

POTASSIUM CARBONATE.—Spot material on offer at £26 10s. per ton ex store. Offered from the Continent at £25 5s. per ton c.i.f. U.K. ports.

POTASSIUM CHLORATE, 99¾/100% POWDER.—Quoted £25 10s. per ton ex wharf. Crystals 30s. per ton extra.

POTASSIUM NITRATE.—Refined granulated quality quoted £19 2s. 6d. per ton c.i.f. U.K. ports. Spot material on offer at about £20 10s. per ton, ex store.

POTASSIUM PERMANGANATE B.P. CRYSTALS.—Quoted 5¼d. per lb., ex wharf.

POTASSIUM PRUSSIATE (YELLOW).—Spot material quoted 7d. per lb., ex store. Offered for prompt delivery from the Continent at about 6¾d. per lb. ex wharf.

SODA, CAUSTIC.—Powdered 98/99% £17 10s. per ton in drums. £18 15s. per ton in casks. Solid 76/77% £14 10s. per ton in drums, and 70/75% £14 2s. 6d. per ton in drums, all carriage paid buyers' stations, minimum 4-ton lots, for contracts 10s. per ton less.

SODIUM BICARBONATE.—Refined recrystallised £10 10s. per ton, ex quay or station. M.W. quality 30s. per ton less.

SODIUM BICHROMATE.—Quoted 3⅞d. per lb. delivered buyers' premises with concession for contracts.

SODIUM CARBONATE (SODA CRYSTALS).—£5 to £5 5s. per ton, ex quay or station. Powdered or Pea quality 27s. 6d. per ton extra. Light soda ash £7 1s. 3d. per ton ex quay, minimum 4-ton lots with various reductions for contracts.

SODIUM HYPOSULPHITE.—Large crystals of English manufacture quoted £8 17s. 6d. per ton, ex station, minimum 4-ton lots. Pea crystals on offer at £14 15s. per ton, ex station, minimum 4-ton lots. Prices for this year unchanged.

SODIUM NITRATE.—Chilean producers are now offering at £9 9s. per ton, carriage paid buyers' sidings, minimum 6-ton lots, but demand in the meantime is small.

SODIUM PRUSSIATE.—Quoted 5¼d. per lb., ex store. On offer at 5d. per lb., ex wharf to come forward.

SODIUM SULPHATE (SALTCAKE).—Prices 50s. per ton, ex works, 52s. 6d. per ton, delivered for unground quality. Ground quality 2s. 6d. per ton extra.

SODIUM SULPHIDE.—Prices for home consumption. Solid 60/62% £9 per ton. Broken 60/63% £10 per ton. Crystals 30/32% £7 2s. 6d. per ton delivered buyers' works on contract, minimum 4-ton lots. Special prices for some consumers. Spot material 5s. per ton extra.

SULPHUR.—Flowers, £12 per ton; roll, £10 10s. per ton; rock, £10 7s. 6d. per ton; ground American, £9 5s. per ton; ex store.

ZINC CHLORIDE, 98%.—British material now offered at round about £20 per ton, f.o.b. U.K. ports.

ZINC SULPHATE.—Quoted £10 per ton, ex wharf.

NOTE.—Please note that the above prices are for bulk business and are not to be taken as applicable to small quantities.

Increase in Polish Sulphuric Acid Requirements

A RECENT survey of the sulphuric acid situation in Poland made by the technical head of the Polish Chemical Union, shows that although production amounted to 330,891 metric tons (in terms of 50° B. acid) in 1928, exports to 29,189 tons, and imports to only 861 tons, there was, nevertheless, a deficiency of 51,437 tons. This surprising conclusion is justified on the two-fold basis that the export trade represented normal, long established trade channels and that the domestic demand was in reality 354,000 metric tons. The phosphate fertiliser industry is estimated to have used two-thirds of all the sulphuric acid consumed in Poland in 1928. Production of phosphate fertilisers had increased from 55,000 tons in 1921 to 345,000 tons in 1928. Nearly all the sulphuric acid produced in Poland is made from zinc blende occurring in Upper Silesia, only 8 per cent. coming from other sources (chiefly pyrites). Three new pyrites plants are under construction, and another is in prospect.

Manchester Chemical Market

(From Our Own Correspondent.)

Manchester, October 17, 1929.

Buying interest in chemical products on this market, so far, at all events, as the principal heavy lines are concerned, has been on a moderate scale on the whole. A fair amount of near delivery business has been reported, with, however, as before, the bulk of the transactions relating to comparatively small parcels. As to values, minor shadings have taken place, but, generally speaking, there is no indication of the market losing its steady tone.

Heavy Chemicals

Sulphide of sodium has met with rather more inquiry of late, and quotations keep up at round £8 per ton for the commercial quality and £9 for the 60-65 per cent. concentrated solid material. A fair trade is going through in the case of caustic soda, particularly in respect of contract deliveries, and prices are firm at from £12 15s. to £14 per ton, according to grade. Chlorate of soda is in moderate request, with offers ranging from 2¼d. per lb. upwards. Bicarbonate of soda continues to be quoted on a contract basis of £10 10s. per ton and a quietly steady business is going through. Very similar conditions obtain in respect of alkali, which is on offer at round £6 per ton. Phosphate of soda has met with a quiet demand this week, and supplies of this material have been obtainable at from £11 to £11 10s. per ton. With regard to saltcake, there is still a fair inquiry about in this section and prices are maintained at up to £3 per ton. Little alteration has occurred in the position of bichromate of soda; a steady trade is being put through and values keep up at about 3⅝d. per lb. In the case of prussiate of soda, offers of this continue very firm at from 4¾d. to 5d. per lb., according to quantity, and a fair amount of buying interest is being shown. Hyposulphite of soda is steady at round £9 per ton for the commercial quality and £15 10s. for the photographic, although inquiry is only on comparatively moderate lines.

In the potash section, the demand for permanganate is rather quiet but values have been maintained at about 5¼d. per lb. for the B.P. grade and 5d. for the commercial. Caustic potash continues to be quoted here at from £32 per ton, and a quietly steady business is being done. Yellow prussiate of potash is selling in fair quantities at firm prices, these ranging from 6¾d. to 7¼d. per lb. There is a moderate movement in the case of carbonate of potash, with offers of the 96 per cent. material in the neighbourhood of £25 per ton. The demand for bichromate of potash is reasonably good and values are well held at about 4¼d. per lb. Chlorate of potash is attracting only moderate attention, but at round 2⅞d. per lb. there has been little quotable change in the price situation.

Buying interest in sulphate of copper is not particularly active at the moment, and down to £26 per ton, f.o.b., is now being asked. Arsenic is still in restricted demand, but offers keep up at round £16 per ton at the mines for white powdered, Cornish makes. A moderate business is going through in acetate of lime at £8 per ton for the brown quality and £16 to £16 10s. for the grey. The lead compounds meet with a limited inquiry at £39 10s. per ton for white acetate and £39 for brown, with nitrate unchanged on the week at about £33 10s.

Acids and Tar Products

Oxalic acid has been in moderate request this week and quotations keep up at round £1 13s. per cwt., ex store. There is a fairly steady call for acetic acid at firm prices, the 80 per cent. commercial being offered at about £36 per ton and the glacial at £66. Citric acid has shown renewed indications of easiness and but a quiet trade has been put through at from 2s. to 2s. 1d. per lb. Tartaric acid is steady at 1s. 4½d. per lb., although only a moderate inquiry has been experienced.

There is a quiet demand about for creosote oil, quotations for which are at round 3¾d. per gallon, naked at works. With regard to pitch, sellers continue to book moderate orders for shipment at up to 47s. 6d. per ton, f.o.b. Interest in carbolic acid is maintained and values are firm at round 9¼d. per lb. for crystals and 2s. 4d. per gallon for crude 60's. Solvent naphtha is in moderate request at from 1s. 2d. to 1s. 2½d. per gallon.

Company News

Erinoid, Ltd.—A final dividend of 4½ per cent. is announced, making 7 per cent. for the year.

Broken Hill South.—The net profit for the year amounted to £358,000, compared with £208,362 last year. The increase is attributed to the improvement in the lead content of the crude ore, the higher average price for lead and the more favourable conditions under which the lead concentrates were realised.

Newtex Safety Glass.—The first report shows a loss for the period from March 31, 1928, to August 31 1929, of £25,897, which includes all development expenditure incurred in starting the factory in 1928 and in carrying out the reorganisation of the factory. Credit balance on share premium account of £20,748 is applied in reducing above loss to £5,149, which is carried forward.

British Metallising Co.—The report for the period from the date of incorporation to June 30, 1929, states that the authorised capital as at June 30, 1929, was £100,000, divided in 1,000,000 shares of 2s. each, all of which are issued and fully paid. The profit and loss account, after providing for management and other expenses, shows a loss of £10,583. The sum of £3,362 has been expended on development and experimental work.

Sadler and Co.—The profit for the year ended June 30 last, after charging income tax, interest on prepaid shares and directors' and auditors' fees, amounts to £17,070 (againt £15,639) and the amount brought forward was £6,778, making £23,848. Of this amount the interim dividend of 3 per cent., less tax, paid on April 15, 1929, absorbs £4,057, and the directors have set aside for depreciation £7,500 (£5,000), leaving £12,291. It is proposed to pay a final dividend of 4 per cent., less income tax, making 7 per cent. (as last year) for the year, requiring £5,409, carrying forward £6,881.

Cheshire United Salt.—For the year ended June 30, 1929, the accounts show a profit of £5,407 (subject to tax) out of which an interim dividend of 2½ per cent. was paid in October, 1928, leaving a balance of £2,846, which would be sufficient to pay a further dividend of 2½ per cent. without encroaching on profit of £2,710 brought in from previous year. Secured notes to value of £1,750 have been redeemed, and mortgage on freehold works has been further reduced by £1,000 during year. When the interim dividend was declared it was not anticipated that the price of salt would fall to the extent it has. Price-cutting has been intense and has reduced the company's profits very considerably. The directors do not recommend payment of a final dividend for the year.

Murex, Ltd.—At the general meeting, held in London, on October 11, the chairman stated that the profits for the year ended June 30 last amounted to £20,981, and, after allowing £2,658 for depreciation, £18,323 remained, subject to income tax, which compared with £15,966 for the previous year. Last January, he said, a circular was issued to their shareholders informing them that the goodwill, patents, trade marks of Thermit, Ltd., the entire issued share capital of which was owned by Imperial Chemical Industries, Ltd., together with certain plant and stocks, had been acquired, and that the payment for same was to be satisfied by the issue of fully paid shares in this company. The number of shares to be issued as puchase consideration was based on the anticipated probable future earning capacity of their company, and had resulted in the shares being issued at a premium of £27,000, which had been transferred to reserve account. He referred to the recent acquisition of another company—the Pure Metal Manufacturing Co., Ltd.—the purchase consideration of which was fixed on similar lines to that of the taking over of the Thermit business. Mention was also made of the assistance which had been afforded the company by Imperial Chemical Industries, Ltd. Their co-operation, the chairman stated, was proving of great benefit, and the Board wished to take that opportunity of thanking them for their services. Mr. E. D. Metcalfe had joined the Board last March as the representative of I.C.I. and they considered themselves very fortunate in having him among them. Their new financial year had started well, and unless anything unforeseen happened the company looked forward with confidence to the results for the ensuing year.

Uses of Fuller's Earth

A Survey of American Practice

A REPORT from the United States Bureau of Mines states that fuller's earth is used mainly as a filtering medium in clarifying or bleaching fats, greases, and mineral and vegetable oils. Its original use was in fulling woollen cloth, and from that it derived its name, but such use, at least in the United States, has almost been abandoned. Fuller's earth is also said to be used in the manufacture of pigments for printing wall paper, in detecting certain colouring matters in some food products, as a substitute for talcum powder, and in medicine as a poultice and as an antidote for alkaloid poisons. Another suggested use is in deliming hides in the manufacture of leather. It has been stated that the fuller's earth cake from oil mills can be used in the manufacture of hand soaps, concrete waterproofing, and asphalt preparations.

Up to within the past few years the term "fuller's earth" has been applied only to clay-like materials that possess the property of bleaching, clarifying, decolorising, or filtering mineral and vegetable oils and animal fats and greases. Material discovered recently in the far West, which is of a different character, is said to be of excellent quality for filtering or clarifying oils.

Occurrence in the United States

Fuller's earth was first discovered in the United States in 1891 near Alexander, Arkansas, by John Olsen. The mineral was used for a time by the Southern Cotton Oil Co., at Little Rock, Arkansas, but its use was finally abandoned. The real beginning of the industry in the U.S., however, was in 1893, near Qincy, Florida, when quite by accident, in an unsuccessful effort to burn brick on the property of a cigar company, an employee called attention to the close resemblance between the clay used and German fuller's earth. This discovery in Florida caused considerable excitement, and deposits of fuller's earth were reported from a number of States, but the material in most of these deposits was found to have no value as fuller's earth. Production began in Florida almost immediately after the discovery, and from 1897 to 1899 fuller's earth was produced in Florida, Colorado, New York, and Utah. Florida maintained its rank as the leading producer continuously until 1924. In 1901 Arkansas again became a producer. From 1904 to 1907 Arkansas was the second largest producer, but no production of fuller's earth has been reported from Arkansas since 1922.

Fuller's earth was found in Georgia soon after the discovery in Florida, but Georgia did not become a producer until 1907, when it ranked third as a producing State: it ranked second from 1909 to 1923, except in 1918 and 1919 when Texas was second; and since 1924 it has ranked first.

Further details are given in the statistical report entitled *Fuller's Earth in* 1928, by Jefferson Middleton, which has been recently published by the United States Bureau of Mines, Department of Commerce. The paper is obtainable from the Superintendent of Documents, Government Printing Office, Washington, D.C., at a price of 5 cents.

Information on Non-metallic Minerals

THE production of a file of technical information on non-metallic minerals has been an important activity of the Building Materials Section of the United States Bureau of Mines, Department of Commerce, since the organisation of the section in May, 1928. The file covers about 40 minerals, the more important of which are: stone in all its branches, sand and gravel, cement, lime, slate, clay, asbestos, feldspar, fluorspar, talc and soapstone, abrasives, and silica. Under each commodity there are sub-classifications such as analyses, costs, lists of producers, milling, mining, occurrence, preparation, prices, production, specifications, substitutes, tariffs, transportation, uses, and many others. Thereafter a series of geographical folders are alphabetically arranged covering each State or country on which information concerning this particular commodity is available. The purpose of this file is not only to provide a ready source of information for answering the numerous inquiries, but the data thus compiled serve to supply the groundwork for the special economic studies that are undertaken.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act of* 1908 *provides that every Mortgage or Charge, as described therein, shall be registered within* 21 *days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case, the total debt, as specified in the last available Annual Summary, is also given—marked with an* *—*followed by the date of the Summary, but such total may have been reduced.*]

ANGLO-DUTCH PETROLEUM CO., LTD., London, W.C. (M., 19/10/29.) Registered October 3, charge for £8,045 4s. 5d. and further sums not ex. therewith £11,000, to Petroleum Storage and Finance Corporation, Ltd., 124, Bishopsgate, E.C.; charged on land and tanks, etc., at Hamside, Poole. *Nil. August 7, 1928.

DISTAS, LTD., London, W., disinfectant merchants. (M., 19/10/29.) Registered October 2, £250 debentures, to F. E. Gibson, 53, Walm Lane, Cricklewood, company director; general charge.

Satisfaction

STORRY, WITTY AND CO., LTD., Hull, paint manufacturers. (M.S., 19/10/29.) Satisfactions registered October 3, £5,000 (not ex.), and collateral debenture, registered July 12, 1910.

London Gazette, &c.

Partnership Dissolved

W. WALKER AND CO. (Austin GREGORY and Alfred HODSON), manufacturing chemists, Newton, Hyde, Chester, by mutual consent as from September 30, 1929.

New Companies Registered

GAYDAY PRODUCTS, LTD. Registered October 10. Nominal capital, £500 in £1 shares. Dye merchants, manufacturers of dyestuffs, chemists, druggists, and sundriesmen, analytical chemists, producers of aniline, synthetic, vegetable or spirit dyes, etc. A director: E. R. Mitford, 3, Granville Chambers, London, W.1.

GERMSTROYD PRODUCTS, LTD. Registered October 12. Nominal capital, £3,000 in £1 shares. To acquire the business of a chemical manufacturer and dealer in germicidal liquids carried on by B. Lipton, at 100, Chapel Street, Salford, and at London, Leeds and Glasgow, as "Germstroyd Products Company," together with the registered trade mark "Germstroyd." A director: B. Lipton, 34, Atwood Road, Didsbury, Manchester.

NORTHERN FERTILISERS, LTD., Bottle House Street, St. Peter's, Newcastle-on-Tyne. Registered October 10. Nominal capital, £1,000 in £1 shares. To acquire the business of Stephenson's Chemical Manure Co., carried on by W. J. Bickers-Stephenson at Bottle House Street, St. Peter's, Newcastle-on-Tyne, and to carry on the business of chemical manure and fertiliser manufacturers and merchants, etc. Directors: W. J. Bickers-Stephenson and W. Straughan.

OIL REFINING PATENTS, LTD., 65, York Terrace, Baker Street, London, N.W.1. Registered October 9. Nominal capital, £500 in 5s. shares. To adopt agreements (1) with H. Hey and (2) with W. A. Street and to carry on the business of clarifiers and treaters of waste and other oils, manufacturers of and dealers in materials, plant, apparatus and appliances which may be employed therein, etc. Directors: H. Hey, W. A. Street, and E. A. Prescott-Day.

ROBT. H. RICE, LTD., 98-100, Seaside Road, Eastbourne. Registered October 15. Nominal capital, £100 in £1 shares. Chemists, druggists, drysalters, oil and colour men, etc. Directors: R. H. Rice, Mrs. Edith M. Rice, and L. J. McDougal.